THE

# AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

**LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.**

**Rooms—No. 39 Nassau Street, cor. Liberty Street, opposite the Post-Office, New York.**

**LONDON:—TRUBNER & CO., No. 60 PATERNOSTER ROW.**

VOL. IV.—No. 63. NEW-YORK, FRIDAY, AUGUST 1, 1862. $3 PER ANNUM.

HERRING'S PATENT

## Champion Fire-Proof Safes.

*Herring's Champion Burglar-Proof Safes, with Herring & Floyd's New Patent Crystallized Iron, the only metal which cannot be drilled.*

Nearly 25,000 Herring's Safes have been made and sold, and over 500 have passed triumphantly through accidental Fires, thus fully sustaining their acknowledged and well-earned character as the "best Fire-Proof Safes the world ever saw."

Herring's New Patent Burglar-Proof Safes, made of a combination of Wrought Iron, Patent Crystalized Iron, and Bars of Steel, are confidently offered to the public as the strongest and best security against skilful burglars now extant.

It was a "Herring's Burglar-Proof Safe," the public will remember, which so lately held secure its trust against the determined ingenuity of the boldest and greatest mechanical burglars this country has ever known, and saved for the New York Exchange Bank no less than

HALF A MILLION OF DOLLARS.

Herring's Patent Fire and Burglar-Proof Safes *combined*, (one Safe within another,) making the most perfect protection from fire and thieves now known.

FIVE OF HERRING'S SAFES VICTORIOUS!

WELLSBORO', Penn., December 21, 1861.

*Messrs. Herring & Co., New York:*

Gentlemen,—At the great fire which occurred here on the 18th December last, my store, with a number of other buildings, was entirely destroyed; no less than seven places of business were burnt out and five of your safes severely tested, in every instance saving their entire contents, to the complete and perfect satisfaction of the owners. Two of your Herring's Patent Champion Safes which were in my building remained there through the entire conflagration, and were not opened until the day after the fire. No water was thrown on the building. Everything in my safe after the fire was nearly as good as new. C. L. Wilcox also preserved all his books, papers, and money in two of your safes, both being in same fire. Wm. Roberts was also the fortunate owner of another of your Patent Champion Safes, which was severely tested, and saved completely his books, papers, and money. The result has given great satisfaction, and we want no safe but Herring's Champion. Please send me one same size I last bought of you immediately. Send by N. Y. & Erie R.R. via Tioga depot. JOHN R. BOWEN.

I had two of Herring's Safes in above fire. They saved my books, papers, and $2,000 *in bank bills*. C. L. WILCOX.

HERRING'S PATENT CHAMPION saved my books, papers, and about $400 in *paper money*. I would use no other. WILLIAM ROBERTS.

GREAT FIRE IN PEARL AND FULTON STS.

NEW YORK, Jan. 27, 1862.

Messrs. HERRING & Co., No. 251 Broadway:

Gentlemen,—The large HERRING'S PATENT CHAMPION SAFE you made for me a few years ago has been put to a severe test in the great fire corner Fulton and Pearl sts., on the 26th inst., which entirely destroyed my building, together with many others.

The fire commenced about 6 o'clock on Sunday morning, and the safe was taken from the ruins after an exposure of more than thirty hours.

Your Safe contained all my books, insurance policies, and other valuable papers besides, gold and silver, bank bills, coupon bonds, &c., amounting to over Two Hundred Thousand Dollars. Everything in the Safe is in perfect order, except the binding of the books being steamed.

Your Patent Champion Safe gives us great satisfaction, and has guarded safely through the fire every dollar of its contents.

Truly yours, A. S. FOSTER.

GREAT FIRE IN NEW JERSEY.

NEW BRUNSWICK, N. J., January 18th, 1862.

Messrs. HERRING & Co.,

No. 251 Broadway, New York:

Gentlemen,—At the recent extensive fire in our city, on Wednesday morning last, 15th inst., I was the fortunate owner of one of your HERRING'S PATENT CHAMPION SAFES, which contained some books and a number of valuable papers.

The heat in my store was very great, and the safe subject to an intense heat. I felt great interest in the safety of my papers, as a number of castings in my store and within a few feet of the safe were melted. Nothing, indeed, was saved in my building, except the contents of your safe, which I am happy to inform you was completely preserved, after a thorough roasting for some seventeen hours. The result has exceeded my anticipations, and fully confirmed my confidence in the security of your Herring's Patent Safe. Please send me another of larger size, and refer all incredulous to my books and papers, which it gives me great pleasure to show.

WM. H. ARMSTRONG.

**Herring & Co., 251 Broadway.**
**Farrel, Herring & Co., Phila.**
**Herring & Co., Chicago.**

## IRON FOUNDRIES.

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Established 1833.

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W. H. MERRICK.

SOUTHWARK FOUNDRY,
Philadelphia.

MERRICK & SONS, Engineers, Manufacturers of every description of Gas Machinery.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either TELESCOPIC OR SINGLE, WITH SUSPENSION FRAMES COMPLETE; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron Lime Sieves for Purifiers, Purifier Hoisting Machines, &c., &c.

Address— MERRICK & SONS,
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OREGON FOUNDRY, Nos. 740, 742, 744 Greenwich Street, New York.

HERRING & FLOYD, proprietors, manufacture Gas Compensators of all sizes, Self-Acting Valves, Exhausters upon an improved plan, costing less than half those of English manufacture, also castings of every description for Gas and Water Works.

Herring & Floyd offer for sale Sabbaton's Patent Screening Shovels for coke and coals, made of malleable iron, of all sizes; Sabbaton's Patent Improved Cast Iron Furnace Frame and Door, arranged to protect the iron work of the door and frame from direct contact with the fire; also, Floyd's Patent Malleable Iron Retort Covers, only quarter of an inch thick, but of convex form, and of great strength, as is attested by certificates from several of the leading Gas-works in America. For engravings of all the above patents see AMERICAN GAS-LIGHT JOURNAL for October, 1859, pages 65 and 71.

Samples of the above castings can be seen at the Rooms of the AMERICAN GAS-LIGHT JOURNAL.

S. FULTON & CO., (Successors to Colwell & Co.) Manufacturers of Pig Iron and Cast Iron Gas and Water Pipes, also Heavy and Light Castings of every description, No. 207 North Water street and 206 North Wharves, Philadelphia.

SAMUEL FULTON, THEO. TREWENDT.

TRANER & MERCER, 117 NORTH Water Street, & 124 North Wharves, Philadelphia, AGENTS FOR THE MERCER FOUNDRY, AND ELK SHEET IRON WORKS.

CAST IRON STREET MAINS; *Bends, Branches, Chemical Retorts, and all kinds of Castings for* GAS-WORKS, either COAL or ROSIN WORKS. SHEET IRON FOR GASOMETERS *cut and punched to order.* BOILER IRON *of all descriptions.* RUSSIA SHEET IRON, TIN PLATES, BLOCK TIN, COPPER, PIG LEAD, SPELTER, and Metals generally.

FLORENCE IRON WORKS.—The subscriber is prepared to execute orders and make contracts for Cast-Iron Water and Gas-Pipes, from 2 inches to 48 inches in diameter; also, Retorts, Bench-Castings, Branches, Bends, and all Castings for Water or Gas-Works. Pipes and Castings coated with Smith's Patent Coal Tar Varnish to prevent corrosion.

JOSEPH G. JONES,
203½ Walnut Street, Philadelphia.

**R. D. WOOD & CO.,**
MANUFACTURERS OF
**CAST-IRON PIPE, RETORTS, &c.**
**Office, 400 Chestnut Street,**
**PHILADELPHIA.**

TO GAS AND WATER COMPANIES:

The undersigned, Agent for Messrs. Thomas Edington & Sons, Phenix Foundry, Glasgow, Scotland, is prepared to contract for all descriptions of Cast-Iron Pipes of their manufacture.

About 6,000 tons of these Pipes have lately been supplied to the Brooklyn Water-works, N. Y., and the Chief Engineer of the Works, A. P. Kirkwood, Esq., is ready to testify to their excellent quality.

ARCH'LD BAXTER, 23 Beaver St., N. Y.

*Sole Agent for the United States and Canada*

## IRON FOUNDRIES.

MORRIS, TASKER & CO.,
**PASCAL IRON WORKS,**
[ESTABLISHED 1821.]

PHILADELPHIA, manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues,

GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

GAS AND STEAM FITTERS' TOOLS, &c.

STEPHEN MORRIS, CHAS. WHEELER.
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CAST IRON WATER, GAS, DRAIN AND HEATER PIPES, &c.,
**COLUMBIAN IRON WORKS,**
OFFICE, No. 46 NORTH SEVENTH STREET,
Below Arch Street, Philadelphia.
THOS. M. ADAMS, Proprietor.

S. S. ASHCRAFT, CINCINNATI, O., Manufacturer of Gas and Water-Pipes, with Branches of every description; Retorts for Gas and Oil Works; Gasholder Stands, Columns, &c.; Gas Purifiers, Condensers, and Gas Apparatus of all kinds; Foundry Work in general.

N. B.—A complete selection of Patterns on hand. Refer to any of the Gas-Works in the Western and Southwestern States.

THEODORE SCOWDEN, Engineer, Louisville.
JOHN JEFFREY, Civil Engineer, Cincinnati.
JACOB HOUGHTON, Engineer, Detroit.

WARREN FOUNDRY AND MACHINE CO., Phillipsburg, N. J. Manufacturers of Cast-Iron Pipes, from 2 to 48 inch diameter, all pipes from 3 inch to 48 inch cast vertically, and in dry sand, in lengths of 12 feet. 2 inch pipes in lengths of 7 feet. Special Castings of all descriptions furnished at short notice.

REFERENCES.
Croton Aqueduct dept., N. Y.
Manhattan Gas Lt. Co., N. Y.
Brooklyn Water dept., N. Y.
Brooklyn Gas Lt. Co., N. Y.
Citizens' Gas Lt. Co., Brooklyn, N. Y.

TO VERTICAL PIPE MANUFACTURERS.—WANTED, a situation as Foreman, or would prefer taking the work by contract, by a man that has had twenty years' experience in Vertical Pipe Moulding; also, has had some years' experience in Green Sand Moulding; best of reference given, by addressing FIRTH & INGHAM, Warren Foundry and Machine Shop, Phillipsburg, New Jersey.

THE ALPHA TUBE WORKS,
WALSALL, STAFFORDSHIRE,—Established 1830.

LAMBERT BROTHERS,
Manufacturers of
LAP-WELDED BOILER TUBES, LOCOMOTIVE AND MARINE ENGINE FITTINGS,
WROUGHT IRON WELDED PIPE,
FOR STEAM OR HIGH-PRESSURE WATER AND GAS;
HIGH-PRESSURE STEAM AND WATER VALVES,
FIRE & GARDEN ENGINE WORK, PUMPS, HYDRANTS, WATER-CLOSETS,
IRON AND BRASS GAS-FITTINGS,
GASELIERS, &c.,
AND OF THE GROVE BEDSTEAD WORKS, WALSALL.
*Delivery Free, in Liverpool, &c.*
*Catalogues post free.*

A small *general* selection of current Manufactures for the Steam-engine, Water Supply, Gas-Works, Distilleries, Brewery, Chemical Works, Mills, &c., at the International Exhibition, Walsall Court, Class 31.

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GASOMETERS, RETORT-HOUSE ROOFS, WATER-TANKS,
PURIFYING-BOXES, COAL-CARS, COKE BARROWS,
AND ALL KINDS OF
WROUGHT-IRON WORK FOR GAS AND WATER WORKS.
Manufactured by GEORGE W. KRAFT, Chestnut street wharf, West Philadelphia, Pa.

POOLE & HUNT, BALTIMORE, MD., are prepared to execute orders for
GAS-HOLDERS,
**IRON-ROOF FRAMING,**
And all other descriptions of
**Iron Work for Gas-Works, Water-Pipes, and Heavy Castings, and Machinery generally.**

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THE LUTHER ATWOOD OIL COMPANY'S

DEODERIZED

ILLUMINATING OIL,

Unsurpassed by any KEROSENE manufactured. Is nearly COLORLESS, of a PLEASANT ODOR, and burns without smoke, or crusting the wick.
WARRANTED NON-EXPLOSIVE.

For sale in any quantity at a greatly reduced price.

Packed in cans and cases for foreign markets.
Apply to U. TALLMAN,
34 Burling Slip, New York.

COAL OIL! COAL OIL!! of the celebrated brand of "SILVER SPRING." A superior burning oil, white, pure, safe, and odorless.

J. S. STANTON, Manufacturer,
No. 132 Maiden Lane.

A LAMP CHIMNEY THAT WILL not break.—Made for the million.

The patent Mica Chimneys for coal-oil Lamps possess many advantages over the glass chimneys. They do not break from the heat, falling, cleaning, or any ordinary usage. When one is purchased it will last, with care, as long as the lamp. They fit all the burners now in use.

AMOS HORNING,
Agent for Manufacturer,
No. 321 North Second st.,
Philadelphia.

N. B.—Coal-Oil Lamps and Coal-Oil at low rates.

PATENTED OCT. 8, 1861.

**Dithridge's Patent**
OVAL LAMP CHIMNIES,

for Coal-Oil burners. Manufactured of
**XX FLINT GLASS.**

These chimnies are intended for the flat flame which, heating all parts of the glass equally, does not expose it to cracking.

E. D. DITHRIDGE,
Fort PittGlass Works,
Pittsburg, Pa.

THE LOVERS' LAMPS.—Price Five Shillings ($1.25) each. To supersede Candles and Night Lights. No Dressing or Trimming required.

EDMUND SPILLER,
Patentee,
98 HOLBORN-HILL, LONDON.
Post-Office orders attended to.

**Ambrose's**
PATENT
**COAL-OIL,**
**NO-CHIMNEY**
**BURNER,**

For Portable LAMPS, LANTERNS, Etc. Requires no Chimney.

Address,
J. E. AMBROSE,
249 Pearl st.,
New York, or
45 Newark Av.,
Jersey City, N. J.

COAL OIL, FOR BURNING.—FINE quality, 40 to 50 cents per gallon, according to quantities. Dealers and consumers can obtain it at the above rates of XAVIER GEX, coal-oil refiner, 75 William street.

AGENTS.—TO ALL WHO USE Candles.—The Candle Lamp just out. Safety and economy in light. No excuse for using explosive fluids. No dropping of tallow on carpets. The Candle Lamp will be sent free on receipt of 25 cents. Agents, male and female, can make a larger profit, and find a quicker sale for the Candle Lamp, than any article yet offered to the public. Send red stamp for illustrated circular.

WM. SUMNER, 208 Broadway, (room No. 10,) N. Y. city.

# PATENT BITUMINIZED PIPES,

## For the Conveyance of Water, Gas, and Drainage.

This important invention, patented by Mr. Charles Newbold, and now for the first time introduced to the public, may confidently be stated to be one of the greatest interest and commercial value, as the Patent Bituminized Pipes possess all the qualities necessary for the conveyance of Water, Gas, Sewage, Mine-Pumps, &c., viz.: great strength, great durability, and inoxidability, with the immense advantage of being about *one fifth* the weight of iron pipes, and about 35 per cent. cheaper; whilst, compared with lead pipes, the Bituminized Pipes are only about *one fourth* their price, without the possibility of the formation of the oxide and carbonate of lead, so dangerous for every purpose. They will stand 150 degrees of Heat, and after many trials it has been satisfactorily proved that rats or vermin will not touch them. They also withstand the action of all acids and salts.

Iron pipes are at present frequently covered with a coating of bitumen or coal tar before they are laid down; but the adherence of this coating to the metal being very imperfect, on account of vibration and the difference of expansion, this preservation is insufficient, besides being exposed to a number of influences which neutralize its efficacy—galvanic currents materially assist the formation of oxides and deposits, which cause the obstruction and eventually the destruction of metallic pipes.

*The Patent Bituminized Pipes* are neutral, non-conductors of electricity, and consequently are not exposed to any of the deteriorating influences mentioned above. The process of manufacture of these Pipes consist in causing a roll of paper to pass through a reservoir of melted bitumen, after which it is tightly coiled around a mandril to any required thickness; and thus, when hardened, a tube is formed of perfect texture, great hardness, and enormous strength. These Pipes are proved, by hydraulic pressure, to resist a pressure of 220 lbs. to the square inch, equal to 506 feet head of water, which is more than double the altitude of the highest reservoir. The bituminous composition which unites and covers these Pipes is so well known as an excellent preservative, that it will be unnecessary to demonstrate that, when laid underground, the durability of the Patent Bituminized Pipes may be considered as unlimited. The Pipes are made in lengths of seven feet, and are connected by socket joints of the same material as the Pipes; or they can be fitted with iron flanged sockets, screwed together in a most simple and inexpensive manner.

*For Gas* these Pipes are invaluable; the Gas-lining which we insert effectualy resists the action of Gas, and being non-conductors, there can be no condensation in them, and the joints made with the Patent Cement are so strong as to entirely prevent Leakage.

The cost of laying the Pipe is also small, compared with those of iron, and can be done by mere laborers. The Bituminized Pipes have been in use the last three years, for the conveyance of gas and have been ascertained to be as perfect now as when first laid down.

### DIRECTIONS FOR JOINING THE PATENT BITUMINIZED PIPES.

Pack the pipes level in the ordinary way; slip the collar over one of the pipes; draw the ends close together and warm them by putting a hot iron between them; then press them together so as to make them adhere; take a piece of iron wire netting, about half an inch in the mesh, a little narrower than the length of the collar, and long enough to wrap once round the pipe, spread the collar over it and the joining; close the ends with clay; pour the melted cement into the manhole of the collar, and fill up the interior space; then remove the clay and the joint is finished.

It is necessary to leave a small vent hole in the clay at each end of the collar to allow the air to escape as the cement is poured in, that there may be no flaws or air bubles in it when cold. If in cooling the cement settles in the manhole, fill up again.

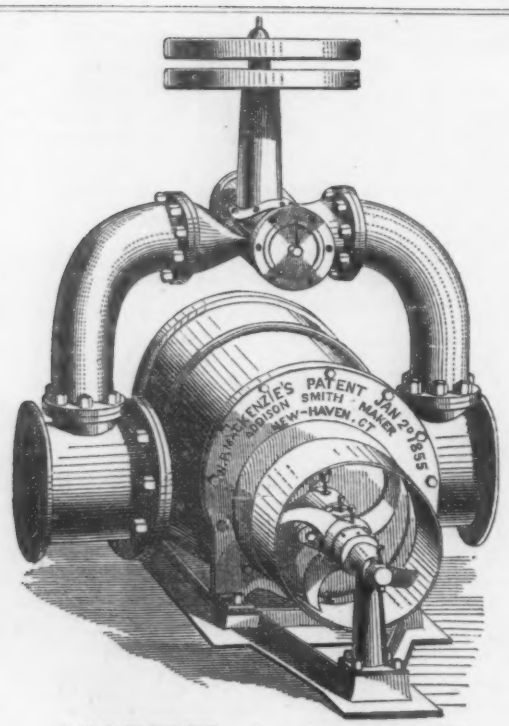
N. B.—The cement should be broken into small pieces and melted in a pot as you do lead, at a low temperature, until it is dissolved; it must be stirred while melting; then take it off and keep stiring it as it cools until it becomes nearly as liquid as water; then pour quickly.

All Orders should be addressed to

THE AMERICAN BITUMINIZED PIPE COMPANY,
**OFFICE 24 WATER STREET, BOSTON, MASS.,**
J. McGEARY, AGENT;

or to FREDERICK W. BOND,
SOLE AGENT FOR NEW YORK,
**58 LIBERTY STREET,** (Between Broadway and Nassau Streets,) **NEW YORK.**

**Cement for Joining, For Sale as above.**




## SMITH & SAYRE,

Sole Proprietors and Manufacturers of

## THE MACKENZIE PATENT GAS EXHAUSTER

AND

## PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. uel. Address SMITH & SAYRE, 458 Broadway, New York.

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AN INDESTRUCTIBLE COATING FOR

## IRON, TIN, and WOOD.

It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids, or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

For cleaning metals it takes the place of crocus, rouge, and emery, being better and cheaper.

This Paint requires no more oil than dry lead or zinc, and much less than the ordinary mineral paints. It is free from any waste, and possesses a spreading and covering power unequaled.

*Terms, by the Barrel or Half Barrel, Four Cents per Pound.*

A liberal discount made to parties purchasing by the ton.

A Barrel or Ton will be forwarded to any gas companies desirous of testing its qualities, for which there will be no charge if it does not give entire satisfaction as being the cheapest and most durable of all other Paints in the market.

DANIEL SLOAN, General Agent,
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CALVIN GAY, 81 State st., Boston.

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The careful shipment of the best qualities, of Cannel and Coal, at the lowest rates current at the time of engagement guaranteed.
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"PEASLEY CROSS" SUPERIOR HOUSE CANNEL.—The undersigned is receiving regular supplies of the above well-known and choice Cannel, selected carefully, for sale, ex ship or from store, in lots to suit purchasers, on reasonable terms.

Dealers can be supplied by lighters, at their yards, from ships Vanguard and New World, now discharging, and from other vessels to arrive.
Apply to RICHARD THACKRAY,
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F. BUTTS & CO. (Successors to BUTTS & KENDALL),
DEALERS IN THE CELEBATED
**Sterling Coal**
**Pittsburgh and other Gas Coals,**
P. O. DRAWER, 74,
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Mercury Cups, Portable Sockets, Burner Pillars, Burner Pliers, &c., &c.

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D. PARRISH, JR., is prepared to furnish estimates for Gas or Water Works, and to erect them on the most improved principles. Office, 1416 Arch st., Philadelphia.
WM. D. PARRISH. D. PARRISH, Jr.

## WHERE GAS-WORKS AND WATER-WORKS ARE WANTED.

We are now publishing regularly the names of the thirty thousand post-towns in the United States, so that builders of gas-works and water-works, and the various manufacturers, may see where are new openings for business. And as each post-master will receive several copies of the AMERICAN GAS-LIGHT JOURNAL, for distribution, the number thus circulated will probably exceed *Three Million Copies. What a chance for advertisers!*

## POST-OFFICE TOWNS IN THE UNITED STATES,

ARRANGED BY STATES AND COUNTIES,

**Showing where Gas-Works and Water-Works are Wanted.**

## TEXAS.

**117 Counties, 715 Towns, 2 Gas-Works, No Water-Works.**

(*Concluded from page* 19.)

**Johnson County.**

| | | |
|---|---|---|
| Alvarado, | Camanche Peak, | Noland's River, |
| Buchanan, | Grand View, | Rock Creek. |

**Karnes County.**

| | | |
|---|---|---|
| Ecleto, | Helena. | Pana Maria. |
| | Home Place, | |

**Kaufman County.**

| | | |
|---|---|---|
| Cedar Grove, | *Kaufman*, (c. h.) | Rockwall, |
| College Mound, | Kemp, | Trinidad, |
| Eureka, | Prairieville, | Turner's Point. |

**Kerr County.**

| | | |
|---|---|---|
| Camp Verde, | Comfort, | Kerrsville. |

**Kinney County.**

| | | |
|---|---|---|
| Camp Hudson, | | *Fort Clark*, (c. h.) |

**Lamar County.**

| | | |
|---|---|---|
| Ben Franklin, | *Paris*, (c. h.,) | Price's Store, |
| Blossom Prairie, | Prairie Mount, | Shockey's Prairie. |

**Lampasas County.**

| | | |
|---|---|---|
| Lampasas, | | McAnelly's Bend. |

**Lavacca County.**

| | | |
|---|---|---|
| Antioch, | Hope, | *Petersburgh*, (c. h.,) |
| Bearden, | Moulton, | Sweet Home, |
| Hallettsville, | Oakland, | Woodport. |

**Leon County.**

| | | |
|---|---|---|
| Bowling, | Franklinville, | Look Out, |
| Cane Branch, | Kidd's Mills, | Moody's Cross Roads, |
| Centreville, | *Leona*, (c. h.,) | Navarro, |
| Clapp's Creek, | | Ringgold. |

**Liberty County.**

| | | |
|---|---|---|
| Cedar Bayou, | Johns, | Tarkington's Prairie, |
| Chambersia, | *Liberty*, (c. h.,) | Wallisville, |
| Grand Cane, | Swartwout, | West Liberty. |

**Limestone County.**

| | | |
|---|---|---|
| Bear Grass, | Mount Calm, | Steele's Creek, |
| Eutaw, | Personville, | Tewoskony Springs. |
| | *Springfield*, (c. h.,) | |

**Live Oak County.**

| | | |
|---|---|---|
| Echo, | Gussettville, | Oakville. |

**Llano County.**

| | | |
|---|---|---|
| Cherokee, | | Llano. |

**Madison County.**

| | | |
|---|---|---|
| Bedi, | Elwood, | Midway. |
| | Madisonville, | |

**Mason County.**

| | | |
|---|---|---|
| Hedwig's Hill, | | Mason. |

**Matagorda County.**

| | | |
|---|---|---|
| Caney, | Deming's Bridge, | *Matagorda*, (c. h.) |
| | Kenner, | |

**Maverick County.**

*Eagle Pass*, (c. h.)

**McLennan County.**

| | | |
|---|---|---|
| Amonda, | Jackson, | Sardis, |
| Bold Springs, | Middle Bosque, | Stark Grove, |
| Gilbert, | Perry, | Waco Village. |

**Medina County.**

| | | |
|---|---|---|
| *Castroville*, (c. h.,) | D'Hanis, | New Fontaine. |

**Milam County.**

| | | |
|---|---|---|
| Bryant's Station, | *Nasheville*, (c. h.,) | San Gabriel, |
| Cameron, | Port Sullivan, | Willow Springs. |
| | San Anders, | |

**Montgomery County.**

| | | |
|---|---|---|
| Danville, | | *Montgomery*, (c. h.) |

**Nacogdoches County.**

| | | |
|---|---|---|
| Cherino, | Greenwood, | Melrose, |
| Douglass, | Linn Flat, | *Nacogdoches*, (c. h.) |
| | Lucknow, | |

**Navarro County.**

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|---|---|---|
| *Corsicana*, (c. h.,) | Muskete, | Spring Hill, |
| Dresden, | Richland Crossings, | Taos. |
| | Rural Shade, | |

**Newton County.**

| | | |
|---|---|---|
| Bloxi, | Cotland, | Newton, |
| Burkeville, | | Salem. |

**Nueces County.**

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| *Corpus Christi*, (c. h.,) | | Ingleside. |

**Orange County.**

| | | |
|---|---|---|
| Dunn's Bluff, | Duncan's Woods, | Orange. |

**Paloma County.**

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|---|---|---|
| Anacatia, | Grand Bluff, | Reed's Settlement, |
| Beckville, | Lineville, | Sugar Hill, |
| Bethany, | Long Branch, | Sweeton, |
| *Carthage*, (c. h.,) | McMillan's, | Walnut Hill, |
| Fair Fay, | Pulaski, | Wood's. |

**Palo Pinto County.**

| | | |
|---|---|---|
| Golconda, | Pleasant Valley, | *Russell's Store*, (c. h.) |

**Parker County.**

| | | |
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| Balch, | Gamma, | Weatherford, |
| Copper Hill, | Newburg, | Weathersfield. |
| | Veal's Station, | |

**Polk County.**

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| Cold Spring, | Dayton, | Morganville, |
| Colita, | Livingston, | Moscow. |

**Red River County.**

| | | |
|---|---|---|
| *Clarksville*, (c. h.,) | Mill Creek, | Robbinsville, |
| Flintham's Tan Yard, | Pine Bluffs, | Savanah, |
| Kiomatia, | | Spencer. |

**Refugio County.**

| | | |
|---|---|---|
| Aranssas, | Crescent Village, | *Refugio*, (c. h.,) |
| Copano, | Lamar, | Saint Mary's. |

**Robertson County.**

| | | |
|---|---|---|
| Owensville, | *Wheelock*, (c. h.,) | Willow Creek. |

**Runnels County.**

Fort Chadbourne.

**Rusk County.**

| | | |
|---|---|---|
| Alma, | *Henderson*, (c. h.,) | Murval, |
| Anadarco, | Iron Mountain, | New Danville, |
| Belleview, | London, | New Salem, |
| Caledonia, | Milville, | Reagan, |
| Cotton Plant, | Minder, | San Cosmo, |
| Fredonia, | Mount Enterprise, | Walling's Ferry, |
| Harmony Hill, | | Wherrys. |

**Sabine County.**

| | | |
|---|---|---|
| Bear Creek, | Fairmount, | Sabinetown. |
| | *Milam*, (c. h.,) | |

**San Augustine County.**

*San Augustine*, (c.h.)

**San Patricio County.**

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|---|---|---|
| Alguna, | | *San Patricio*, (c. h.,) |

**San Saba County.**

San Saba.

**Shelby County.**

| | | |
|---|---|---|
| Buena Vista, | Hamilton, | *Shelbyville*, (c. h.,) |
| Clay's Mound, | Hilliard, | Truit's Store, |
| Graham's Mills, | | White Cottage. |

**Smith County.**

| | | |
|---|---|---|
| Flora, | Mount Carmel, | |
| Garden Valley, | Mount Sylvan, | Starville, |
| Jamestown, | Ogburn, | *Tyler*, (c. h.,) |
| | Seven Leagues, | Troup. |

**Starr County.**

| | | |
|---|---|---|
| *Rio Grande City*, (c. h.,) | | Roma. |

**Tarrant County.**

| | | |
|---|---|---|
| Ashland, | Fort Worth, | Hawkinsville, |
| Atchison's Point, | Johnson's Station, | Merrilltown, |
| Birdsville, | Gilleland, | Robinson's Mills, |
| Estill's Station, | Grape Vine, | Webberville. |

**Titus County.**

| | | |
|---|---|---|
| Daingerfield, | Green Hill, | Monticello, |
| Ella, | Hagansport, | *Mount Pleasant*(c.h.) |
| Gray Rock, | Lone Star, | Snow Hill, |
| Gouldsboro', | | Union Bridge. |

**Travis County.**

| | | |
|---|---|---|
| *Austin*, (c. h.,) | Gilleland Creek, | Merrilltown, |
| Bluf Springs, | Hornsby, | Perdinales, |
| Case's Mills, | | Webberville. |

**Trinity County.**

| | | |
|---|---|---|
| Beasly's Store, | Lake, | Sumpter. |

**Tyler County.**

| | | |
|---|---|---|
| Billum's Creek, | Paulineville, | Providence Hill, |
| Caney Head, | Peach Tree Village, | Town Bluff, |
| Pamplin's Creek, | | *Woodville*, (c. h.) |

**Upshur County.**

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|---|---|---|
| Calloway, | *Gilmer*, (c. h.,) | Point Pleasant, |
| Carrollton, | La Fayette, | Red Rock, |
| Coffeeville, | Omega, | Simpsonville, |
| Earpville, | Pine Tree, | West Mountain. |
| | Pittsburgh, | |

**Uvalde County.**

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| Uvalde, | | Sibinal. |

**Vanzant County.**

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| Big Rock, | Canton, | Hamburg, |
| Barren Ridge, | Edom, | *Jordan's Saline*(c.h.) |
| | Four Mile Prairie, | |

**Victoria County.**

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| Anagua, | Mission Valley, | *Victoria*, (c. h.) |

**Walker County.**

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|---|---|---|
| Goshen, | McKenzie, | Tuscaloosa, |
| *Huntsville*, (c. h.,) | Newport, | Waverly. |

**Washington County.**

| | | |
|---|---|---|
| *Brenham*, (c. h.,) | Evergreen, | Union, |
| Chapel Hill, | Gay Hill, | Vine Grove, |
| Day, | Independence, | Washington, |
| Doddville, | Long Point, | Ye Gua. |

**Webb County.**

| | | |
|---|---|---|
| Carrizo, | | *Laredo*, (c. h.) |

**Wharton County.**

| | | |
|---|---|---|
| Egypt, | Waterville, | *Wharton*, (c. h.) |

**Williamson County.**

| | | |
|---|---|---|
| Bagdad, | Florence, | Liberty Hill, |
| Circleville, | Gabriel Mills, | Pond Spring, |
| Corn Hill, | *Georgetown*, (c. h.,) | Post Oak Island, |
| Cross Roads, | | Round Rock. |

**Wise County.**

| | | |
|---|---|---|
| Cactus Hill, | Decatur, | Odessa, |
| Catlett's Creek, | | Prairie Point. |

**Wood County.**

| | | |
|---|---|---|
| Holly Spring, | *Quitman*, (c. h.,) | Webster, |
| Lake Fork, | Sand Spring, | Winnsborough. |

**Young County.**

| | | |
|---|---|---|
| Brazos Agency, | | Fort Belknap. |

## PAPERS ON HYDRAULIC ENGINEERING.

BY SAMUEL MCELROY, C. E.

*No. 1.—Reservoir Construction.*

[From the Journal of the Franklin Institute.]

The principle of collecting water for public or personal use, is directly connected with the introduction of water-works; and preliminary to examination of the several theories or systems of construction and use which have been followed, a brief historical summary of ancient and modern practice is important, which is taken from Cresy's Encyclopædia, and other works for the former, and principally from local reports for the latter.

*Egypt.*—In two of the prominent cities, Carthage and Alexandria, the former containing upwards of 700,000 inhabitants, and the latter over 300,000, the first received its supply of water through a large aqueduct, which emptied itself into a great number of reservoirs or cisterns in different parts of the city, about 100 feet long by 30 feet wide, through earthen pipes laid for the purpose, said to be still visible; while the second was supplied from the river Nile, covered stone conduits lined with cement, being carried to each private dwelling, discharging into small cisterns built for the purpose, of the same material and lining, also covered. In the wars between Rome and Alexandria, when the Roman army had obtained possession of a portion of the city, they were much surprised and annoyed by the Alexandrian general, who cut of their supply of fresh water, turning into their conduits salt water in its stead; but by their united exertions in a single night, they dug wells sufficient to supply their wants. The fact, taken in connexion with the enormous cost of this system of distribution, goes to show very clearly their care to provide the wholesome water of a river, in preference to the unwholesome water of wells, where used by a large population. While, in the case of Carthage, these numerous reservoirs would seem to have been used for direct private supply, without introduction to each house, as is now the case in some European cities.

Recent visits to the remains of Utica, by H. B. M. ship *Harpy*, describe the main subterranean reservoir of about 320 feet diameter, with six cisterns 86 feet from it, 135 feet long, 19 feet 7 inches wide, not less than 17 feet deep, built with arched roofs, connected with each other, and in good preservation.

*Greece.*—On the island of Samos, a canal was cut through a mountain to obtain the supply of water from a copious and celebrated spring; and at a point near the aqueduct, several caverns were cut to receive its supply, whence the water was probably drawn by hand for use.

On the island of Tenedos, there still remains an ancient stone building, in which the water used by the inhabitants was collected, after it was brought from distant springs, in earthen pipes.

Among other remains of the city of Cnidus, are several slabs of marble, channeled out for water conduits.

On the island of Cos, an aqueduct three miles in length is built, which supplies the inhabitants, the cover being removed, to enable them to get at its contents.

In the city of Syracuse, one of the reservoirs is described as being cut out of the solid rock, as was the aqueduct which supplied it, being 57 feet long, 23 feet wide, and 10 feet deep.

In other Grecian cities, conduits of stone masonry are found leading to subterranean reservoirs, arranged in a similar system of distribution.

*Italy.*—In the arrangements for distribution made by the engineers of Rome, the water brought to the city by the several aqueducts, was received at the walls of the city, in reservoirs specially adapted to each supply. The levels of the several sources at these reservoirs, differed materially, that of the Anio Novus being 158.8 feet above the level of the Tiber; while, of the six other aqueducts, three were above a level of 125 feet, and the other three standing at 82.5, 34.2, and 27.4 feet above this river, which, at the city, was 91.5 feet above the Mediterranean.

Each reservoir, or *castellum*, had "a triple cistern attached to it to receive the water. Three conduits of equal dimensions, were connected in such a manner

that when the water was more than necessary for the supply of the outer, it was discharged into that of the middle, which served all the pipes of the public fountains: one of the mains supplied the baths, the other the private houses. The object of this contrivance was to provide first, for the public wants, then the baths, and afterwards private individuals.

"At the end of each of these three conduits, was a receptacle whence the general distribution was made; at the sides were two others, to take off any superabundant quantity. By such an arrangement, the various supplies were regulgted with the greatest nicety. The total width of the *castellum* (of the Aqua Julia) is 115 feet. No expense was spared in the construction of these stupendous edifices, which, attached to the numerous aqueducts of Rome, must have resembled palaces. Built of squared stone, and lined with brick coated with a fine cement, every precaution was taken to prevent leakage or infiltration. The several conduits and pipes were provided with valves and cocks, for shutting off or turning on a supply to any direction."—*Cresy's Encyclopædia*, p. 172.

Ample provision was also made for cleansing the several chambers by flushing ports, built in the centre and secured by a plug, or a cut stone.

Every house in Rome was supplied with water, a portion of the expenses being met by private tax on each house. In many cases fountains were placed in the courts, and in others cisterns were used, either open or covered. These were supplied from the *castellum*, principally by earthen pipes, although lead pipes were much in use in Italy. Wooden pipes were sometimes used for economy: pipes of terra cotta were also used, and iron pipes were not unknown. In some of the baths, copper pipes were used, but seem to have been limited in number.

The Romans seem to have preferred the earthen pipes for distribution, as they did earthen vessels for drinking, on account of their superior coolness and purity. The tubes were made not less than two inches thick, the end of one fitting into that of the other. The joints were coated with a mixture of quicklime and oil, the pipes resting on stone blocks, to keep them in line, and in some cases they were entirely coated with cement.

In the city of Venice, all the springs met with in constructing the foundations of the houses, were led into wells built to receive them. In the absence of a spring, the wells were supplied by rain water from the roof, and these supplies failing, as they sometimes do, resource is had to the main shore, for supplies brought in boats. These subterranean reservoirs are very carefully built, lined with a peculiar clay of the locality, and preserve the water in coolness and purity.

In other cities of Italy, the population is supplied by public reservoirs, placed at different points throughout the city, at a level below the ground.

*Turkey.*—In the city of Constantinople, one of the covered reservoirs, or *cisternæ*, connected with the distribution system, still remains. It is constructed of brick covered with cement. It has a vaulted roof supported by marble columns, the cistern being 336 feet long, about 200 feet broad, and containing when filled to about 40 feet depth, 25,000,000 gallons of water.

Remains of these *cisternæ* are found in Rome, independent of the *castellæ*, which received the aqueduct supply. They are also to be found in Spain.

*Judea.*—The city of Jerusalem is still supplied in part from the pools of Solomon, which were cisterns or reservoirs of masonry, receiving an aqueduct discharge, and works of this kind characterize that country.

The countries of Assyria and Persia, Babylon and other great cities, contained extensive provisions for water supply.

*Peru.*—In this country reservoirs were constructed by the Incas on the Andes, from which aqueducts were built hundreds of miles in length, exceeding in character those of Rome. One, in the valley of Condesuyu is four hundred miles long, and is still in partial use.

*Mexico* is also famous for the aqueduct of Chapultepec, and the line over Lake Tezcuso.

It would appear from these statements, that with the ancients the system of distribution to each private house was not universally in use, the inhabitants being obliged to go to the *cisternæ* for their more immediate supply. And, as in those cases on record, of house distribution, the open fountains, open *limariæ*, or covered *piscinæ*, were at or below the level of the ground, and fully connected by waste pipes with the systen of sewerage, it is evident that the system of distribution *under pressure* was not in general use, so far as an available head within the house was concerned.

*Modern Europe.*—In a large number of European cites, as has been also the custom in Canadian cities, and as was the practice for many years in New York, the population is supplied from the public fountains or other sources by water carriers. The supply of the *Canal de l'Ourcq* in Paris was distributed in this way.

In other cities, as in London and Hamburg, the supply is carried to the consumers by distributing pipes, under the pressure of stand-pipes connected with pumping engines, reservoirs being used rather as reserves for fire purposes than for house service.

*London*, previous to the year 1582, derived its supply by individual resort to the Thames, to wells, and to suburban streams. About that time a tide-wheel was erected at London Bridge, which forced the water of the Thames into a cistern on a wooden building 120 feet high, from which leaden pipes carried its supply to several districts of the city, pipes of wood and stone being in occasional use at a later date. With this distribution service, under additional pumping power, which was mainly of wood up to 1810 and 1815, as also in other cities of England, the greatest head in the houses was limited to 6 feet above ground.

The character of the supply furnished the citizens of London by the nine water companies in operation previous to 1852, has this remarkable peculiarity, that it was carried on under what is called the *intermittent system*, or in other words, that each company subdivided its distribution district into convenient sections, but one of which was supplied at a time, and in no case more than once a day, sometimes not more than three a week; and that the supply of water under the stand-pipe head at the engine-house, was kept on each section for a daily interval varying from three-quarters of an hour to three hours, but very rarely as long as three hours. Notwithstanding the use of cast-iron distribution pipes, the elevation of this intermittent supply to the upper stories of dwellings was confined to the more expensive houses, and as a general rule, all the supplies were received in cisterns or other receptacles very near or quite below the street grade. In most cases the mains were supplied direct from the engines through the engine-house standpipes, a process for which these standpipes were specially adapted.

To receive and retain for use this alternate supply, all the better class of houses were provided with cisterns, or water butts of sufficient capacity for this purpose. No such provision, however, seems to have been made for the poorer classes, who were obliged to draw their supply from short standpipes placed in the several courts, one pipe of this kind serving for from 50 to 100 houses, the water being kept in the pails, jars, buckets, &c., in which it was caught.

From the Parliamentary Reports on this subject of 1850, it appears that of 288,037 houses in the city district of supply, 17,456 houses, or about 6 per cent., were unsupplied by any direct means; in special districts the ratio sometime being as high as 18 per cent.

In the several Reports of 1850, '51, and '52, on the disadvantages of the present London supply, the objections to this peculiarity, which also prevails in many other cities of Great Britain, are clearly and strongly urged.

The New River Company has six subsiding reservoirs within the city limits, and uses six engine stations. Two are lined with brick-work, the others being excavated in clay bottom, with side slopes of 2.5 to 1, faced with broken stone for protection from wash. Two, being 86 feet above Trinity datum, supply by gravitation. The highest service is 430 feet. Their joint area is 50 acres; level, 82, 86, 112, 154, and 400 feet; contents, about 8.5 days supply, as an average, the highest holding 1 day's supply; joint contents, 120,268,176 gallons. Daily distribution in 1848, 14,-149,315 gallons.

The East London Company has five subsiding reservoirs, at datum level, 30½ acres area jointly. Contents, 32,500,000 gallons. Lined in part with Kentish ragstone, brick-work, and gravel. The sixth, lined with brick-work, on Stamford Hill, is 86 feet above, and contains 2,500,000 gallons. Daily distribution in 1850, 8,829,462 gallons; highest service, 120 feet.

The Southwark and Vauxhall Company has no reservoirs, except for subsidence and filtration from the Thames. Highest service, 185 feet.

The West Middlesex Company has two subsiding reservoirs from the Thames of 16 acres area; a reservoir on Camden Hill, less than 1 acre in area, lined with brick-work, at 111.5 feet level, containing 3,456,-000 gallons; and another on Barrow Hill, lined with brick, 1.5 acres area; contents, 4,572,000 gallons; level, 167.5 feet. Daily distribution in 1849, 3,334,054 gallons; highest service, 207.5 feet.

The Lambeth Company has a reservoir on Brixton Hill, lined with brick-work with paved bottom—level, 105 feet; area, 3 acres; contents, 12,150,000 gallons; depth, 20 feet; and another on Streatham Hill, with brick walls and clay bottom—level, 185 feet; area, 1.25 acres; contents, 3,750,000 gallons. Daily distribution in 1849, 3,077,260 gallons; highest service, 350 feet.

The Chelsea Company pumps into a subsiding reservoir at low grade, 3.5 acres area, 15 feet deep. It has a reservoir at Green Park with brick walls and paved bottom, 10 feet deep; area, 1.5 acres; contents, 3,000,-000 gallons; and one at Hyde Park with brick walls on concrete—area, 0.75 acres; 7 feet deep; contents, 1,021,000 gallons. Daily distribution in 1849, 3,940,-730 galls.; highest service, 157 feet.

The Grand Junction Company has one reservoir at Camden Hill, with slopes lined with concrete and brick paved bottom—area, 1.75 acres; contents, 6,000,000 gallons; level, 123 feet. Daily distribution in 1849, 3,523,013 gallons; highest service, 150 feet.

The Kent Company has three reservoirs lined with concrete or Kentish ragstone: one at Greenwich Park, level, 140 feet; one at Deptford, level, 100 feet; and one at Woolwich Common, level, 200 feet. Joint capacity, 3,865,344 galls. Daily distribution in 1849, 1,079,311 gallons; highest service, 220 feet.

The Hampstead Company has a joint reservoir surface of 35 acres. Daily distribution, 427,468 gallons; highest service, 215 feet.

The metropolitan district supplied by these nine companies is about 10.5 miles long by 8 miles wide; total average daily distribution in 1849, 44,383,332 gallons; population supplied, 2,156,417; joint elevated reservoir contents, 206,000,000 gallons. From these statements may be inferred the relation borne by the London reservoirs to the distribution service, as to elevation and capacity, and the general plan of arrangement adopted.

The new supply of the Chelsea Company at Thames Ditton, embraces a supply and summit reservoir on Putney Heath, 6 miles from the engines, and 165 feet level. It combines a double covered and a small open reservoir, the former for domestic use, the latter for park and street purposes. The former is in two divisions, 20 feet deep, each 310 by 160 feet surface; contents of both, 10,150,000 gallons. The inside slopes are one to one, faced with concrete, with which the bottom is covered 1 foot thick. The roofing is of 8-inch brick arches on piers, with concrete filling in the branches, and covered with puddling. This supply inaugurates the *constant system*, or system of constant pressure for London.

*Liverpool* and *Glasgow* are examples of this system as in use in the United States. The Rivington Pike Reservoir is capable of supplying the former with 13,000,000 gallons daily; and for the latter, the Ryat Linn, added to the Waulkmill Glen Reservoir, the one at 298.3 feet, and the other at 283 feet level, 50 feet deep, hold 50,000,000 cubic feet of water, at a point 5 miles from the city. A filtering apartment is in use here, passing over 3,000,000 gallons per day. In case of this kind, where flat bank slopes 3 to 1 are used, they are generally protected by rip rap walls, or a mixture of furnace cinders and small stones with clay.

*United States.*—Notices of a few reservoirs in this country will serve to illustrate the subjects of discussion.

The Beacon Hill Reservoir, Boston, is the most elaborate structure of its class. It is a rectangle, built above the street grades, the walls being from 41 to 58 feet high. The outside walls are built in solid cut granite masonry, with a heavy ornamental copin, the

inner walls being of the same material, 5 feet thick at the base, on a concrete bed, and 3 feet at the top; the floor is paved with concrete 3 feet deep, and covered with two courses of brick-work. The level is 121.53 feet, depth of water-way 13.5 feet, contents 2,678,961 gallons. The average depth in 1861, in consequence of extraordinary city consumption, was 9 feet.

The Murray Hill Reservoir, New York, is built in two distinct divisions, with retaining walls of heavy stone masonry, arched cells being constructed around the entire structure, behind the face-walls; its coping grade is about 49 feet above the street. Its division wall is of concrete faced with rubble masonry, 18 feet wide at base, 7 feet at flow line, built on a concrete bed, and carried up to coping level. Its inner slopes, 1 to 1, are laid in stone masonry 15 inches thick, to 4 feet above bottom, whence they are covered with 12 ins. of concrete, also continued over the whole floor. Its level is 112 feet; contents, 38 feet deep, 21,000,000 gallons; its inner size is 386 feet sqnare. Its flow-line is 4 feet below inner coping. Its ordinary depth is about one-third of its full depth.

Prospect Hill Reservoir, Brooklyn, is built in earth-work. The inner slopes, 1.5 to 1, are puddled 2 feet thick, covered with 3 inches of concrete, and 8 inches of brick-work to the top angle, which has a coping 3 feet wide, on masonry bed. The floor is puddled 2 feet deep, covered with 4-inch brick-work grouted. Its contents are 20,000,000 gallons, depth 20 feet, level 197 feet.

The Cleveland Reservoir is on embankment, with a base 21 feet above grade. Earth retaining banks are constructed 25 feet high, inner slopes 1.75 to 1, outer 1.5 to 1. The slopes and floor are covered with 2 feet of puddling, with a facing of brick-masonry. Its depth is 20 feet, level 150 feet, contents 6,000,000 gallons.

The new Reservoir, Fairmount, Philadelphia, completed in 1852, is of earth-work, with inside slopes of 1.5 to 1, lined with puddled brick-clay, 12 to 15 inches deep, covered with a layer of concrete, on which 4-inch brick masonry is laid; at the foot of the slope the brick-work abutment is 8 inches thick; the bottom is puddled, covered with brick laid flat and grouted. Its water surface is over 4 acres, contents 20,321,392 galls, depth 16 feet, level 98.14 feet. This completes the group of five divisions for this district, which are used for subsidence and supply, and aggregate 47,218,028 gallons capacity.

The Belleville Reservoir, Jersey City, N. J., is of earth-work, with puddled slopes and floor, inside slopes 1.5 to 1, covered with concrete mortar and 4-inch brick-work, which is backed with rubble-masonry for 5 feet below top angle, 18 inches thick. Level 158.83, contents 14,000,000 gallons, inner size 323 by 396 feet; level of force-tube discharge 160.79.

The Louisville Reservoir is built in two connected divisions, in earth-work, the banks being carefully worked down; inside slopes 1.5 to 1, covered with 4-inch brick-masonry, which is 8 inches thick to a point 6 feet above bottom, the floor being puddled and covered with two dry flat courses of bricks. Its level is 150 feet, depth of water 20 feet, division banks 12 feet high, and 12 feet wide at top; contents 7,000,000 gallons; height of stand-pipe 180 feet.

The Detroit Reservoir is built in two distinct divisions, with embankments of soluble clay, carefully made, with interior puddle walls. The inner slopes are 1.5 to 1, faced with 4-inch brick-work, commenced with the intended use of 3-inch concrete backing, which does not appear to have been completed. The upper wall was laid in a temporary manner. Its level is 77.5 feet, contents 7,592,704 gallons, depth 25.5 feet, flow-line 3 feet below top angle, division-wall 10 feet wide at top.

The Manhattan Reservoir, New York, is built in two distinct divisions of different areas and depths, which can be connected by a pipe 15 feet below flow-line. It has earth embankments, with outer retaining walls of heavy masonry, laid dry and pointed with cement. Its interior slopes are 1.5 to 1, paved with heavy dry wall from the rock blasted from its bottom. The banks have interior puddled-walls. Its depths are 20 and 25 ft., water surface 31 acres, contents 150,000,000 gallons, level 115 feet. The floor is partly on rock, and is not puddled.

The new Croton Reservoir, under the specifications of 1857, is built of earth-work, in two connected divisions, the top of division-wall being 3 feet below flow-line. The banks, which are 15 feet wide at top, and 4 feet above flow-line, have interior puddle-walls; the inside slopes are 1.5 to 1, covered with an 18-inch dry wall laid on 8 inches of small stones. The head of the division-bank is protected by 18 inches of rubble-masonry on 8 inches of concrete, carried with 10 feet face down the slopes. The puddle-walls are commenced on concrete beds, or the rock-face, the floors not being puddled. Its depth is 38 feet, water-area 96 acres, contents 1,029,880,145 galls. (N. Y.), level 115 feet. In 1859, the plan of slope-lining was changed for a wall of solid rubble-masonry.

The Hartford Reservior is small and irregular in form, built in earth-work, of compact material. Its inner slopes vary from 1.5 and 2 to 1, on different sides, and are faced with two courses of dry stone, each 9 inches thick. Puddle-walls are built in the banks. Its depth is 30 feet, greatest inner length 395 feet, and width 187 feet; contents 7,830,000 gallons, level 120.94 feet.

Ridgewood Reservoir, Brooklyn, is of earth-work, in two distinct divisions. The puddling is made two feet thick on all slopes excavated, and in walls, in all embankments, being carefully connected with the floor puddling, which is 18 to 24 inches thick. The inside slopes, 1.5 to 1, were covered with a dry wall of 16 inches, and had a 6-inch backing of small stones for a depth of 8 feet below flow-line. This being injured by the action of surface-waves in 1859, was carefully relaid where necessary, and pointed for a depth of several inches in cement. Its depth is 20 feet, water-surface 25.61 acres, contents 153,956,402 gallons, level 170 feet.

The Brookline Reservoir, Boston, which is chiefly a natural basin, has its inner slope lined with dry stone 18 inches thick, for a belt of 14 feet in width. This width was increased on account of the action of surface-waves and ice. Its depth varies from 14 feet to 24 feet; contents, 89,909,730 gallons; water-surface, 6 feet below top bank, 22.31 acres; level of this surface, 120.6 feet.

All the reservoirs of this country are arranged upon the *constant service* system, although instances occur of the use of standpipes, which are made to act as reservoirs under this principle, as in the Twenty-fourth ward works at Philadelphia.

*(To be continued.)*

WATER SUPPLY OF VENICE.—The city of Venice is wholly supplied with rain water which is retained in cisterns. The city occupies an area of about 1,300 acres. The annual average fall of rain is 31 inches, the greater part of which is collected in 2,077 cisterns, 177 of which are public. The rain is sufficiently abundant to fill the cisterns five times in the course of the year, so that the distribution of water is at the rate of 312 gallons per head. To construct a cistern after the Venetian fashion, a large hole is dug in the ground to the depth of about 9 feet. The sides of the excavation are supported by a framework made of good oak timber, and the cistern thus has the appearance of a square truncated pyramid with the wider base turned upward. A coating of pure and compact clay, 1 foot thick, is now applied on the wooden frame with great care; this opposes an invincible obstacle to the progress of the roots of any plants growing in the vicinity, and also to the pressure of the water in contact with it. No crevices are left which might allow the air penetrate. This preliminary work being done, a large circular stone, partly hollowed out like the bottom of a kettle, is deposited in the pyramid with the cavity upward; and on this foundation a cylinder of well-baked bricks is constructed, having no interstices whatever, except a number of conical holes in the bottom row. The large vacant space remaining between the sides of the pyramid and the cylinder, is filled with well-scoured sea sand. At the four corners of the pyramid, they place a kind of stone trough covered with a stone lid pierced with holes. These troughs communicate with each other, by means of a small rill made of bricks, and resting on the sand; and the whole is then paved over. The rain water coming from the roofs of the buildings runs into the troughs, penetrates into the sand through the rills, and is thus filtered into the well-hole by the conical holes already described. The water thus supplied is limpid, sweet, and cool.—*Scientific Amer.*

## GAS METERS—WET AND DRY.

BY J. O. N. RUTTER.

[From the Journal of Gas Lighting.]

Which do you consider the best kind of meter—the wet, or the dry? Whose meters do you recommend? What is your opinion of the alterations lately made in A's meters? Have you much trouble with the meters made in conformity with the Sale of Gas Act?

Such questions, and probably half a dozen more of similar import, may be heard almost every day. They show a desire to obtain information; but, at the same time, it is tolerably plain, that to ask questions is much easier than to answer them.

It is no part of my present purpose to discuss the relative, or actual, merits of wet and dry meters. Their various forms, the materials of which they are made, their principle of action, and the skill bestowed upon their mechanism, will, most likely, be referred to in general terms. Such references, however, will be incidental rather than direct, and will not in the remotest degree point towards meters made by any particular person.

A great deal might be said about meters: their early history, the ups and downs which have attended them, their failures and successes, and the triumphs which patience, and courage, and perseverance have achieved. It would be very pleasant again to go over some of the often-trodden ground, to call up old recollections, and to fight again with some of the almost-forgotten objections and prejudices. But the subject is too interesting—rather, I might say, too tempting—inasmuch as it would be sure to draw off attention from what is just now of greater importance, namely, gas-meters, both wet and dry, in their practical and commercial aspects.

During many years, the wet meter had the field of operations to itself. Never was any machine worse used or more abused. In its younger days, it had to struggle with prejudice, ignorance, and misrepresentation. When it grew older, its course was not much pleasanter; for, on the introduction of its rival, it was accused of offences of which it never was, nor ever can be guilty.

Doomed to labor almost unknown and unnoticed, in dark cellars and dirty out-houses; in kitchens, cupboards, and areas, the meter has always been an object of aversion and undeserved suspicion. But it is the best friend which gas companies have ever had. The benefits it has conferred on them, and on society in general, are beyond all calculation. No language which I can employ will sufficiently proclaim its praises. In extending the uses, in simplifying the applications of gas, and in equalizing and cheapening its prices, the meter has had no equal.

These things are not sufficiently understood, or, if known and understood, but seldom acknowledged. There are many houses where a gas-meter has been at work for years. As long as everything connected with the gas-lights has gone on pleasantly, no notice has been taken and no inquiries made of the careful accountant. Let the supply of gas be deficient, the lights burn unsteadily, or suddenly go out, or let the rate of consumption be a little greater than ordinary, or the meter, by long-continued hard work, have some part of its mechanism deranged or worn out, and its past services and uniformly good behavior are instantly forgotten. Listen to the abuse it receives! One would suppose it had always been ill-behaved—always troublesome—always unfaithful; just as bad as servants who spoil the dinner, make too free with the wine, or run off with the plate.

Weighing and measuring, according to local or general customs and the nature of the commodities, are so well understood, and so necessary between buyers and sellers, that they need only to be mentioned to illustrate the principle to which the meter is applicable. There is nothing mysterious about it. Simplicity and fidelity are its most remarkable properties. It differs from ordinary measures of capacity in its form and in being self-acting, but it is just as much a measure as the commonest of them.

Nor is there any uncertainty in the operations of a gas-meter. Properly adjusted and fairly treated, it is preeminent for accuracy, greatly surpassing all ordinary kinds of measures. Look at pint or quart measures for milk or beer, or smaller or larger measures

for wines, spirits, or oil; or look at the measures, and the methods of using them, employed in the sale of corn, seeds, fruit, vegetables, and a hundred other articles, in daily, hourly demand. Are such measures—standards as to legal accuracy though they may be—deserving the name of standards of perfection in their uses and management? It is impossible to fill and empty ordinary measures without error or waste.

It has become so common a practice to find fault with gas-meters, that many persons, who ought to know better, are guilty of it. If a small portion of the time spent in grumbling had been devoted to a careful examination of the principle and the mechanism of these useful instruments, there would be fewer complaints. Knowledge inspires confidence. All that need be known could be acquired in a few minutes, and then everything would be intelligible, and, because understood, perfectly satisfactory.

What has a meter to do, and how does it perform its duties? Attached to the pipe through which the gas passes to the premises of the consumer, the meter acts as a sentinel; guarding the passage so as, on one side, to protect the consumer, and on the other, the gas company. It is under the control of the consumer; working or standing still, moving quickly or slowly, entirely at his bidding. The consumer receives no gas without its first passing through the meter. In so passing, it is measured, and the quantity recorded. Never was there a happier thought, or a more wonderful contrivance; an impartial witness to the transactions between buyer and seller, and an accountant whose honesty cannot be impeached. All this seems easy enough to think and to write about when the process is understood, and when what is going on inside a meter is as present to the eye of the mind, as its external parts are visible to the bodily eye. Here is the chief difficulty. A mystery has been made, or pretended to be made, of what is no mystery at all; whilst those who ought to have taken most pains to make the principle and the merits of meters known, have shown the greatest unwillingness to do so.

The wet meter—so called because its operations depend on the presence of a certain quantity of water—performs its duties by the agency of a revolving-wheel. Call it a water-wheel, and it is not far wrong; the power being applied to the inside. This wheel is divided into separate compartments, so constructed that, whilst gas is entering any one of them, the same quantity can pass out of the meter only from that next adjoining. The wheel is set, and kept in motion by the gas, which, entering from the street-mains, makes an effort to force itself into the house. The meter so far resists its progress, that it is compelled to enter each compartment of the wheel in succession, and to remain a longer or shorter period, according to the quantity required. When no gas is consumed, the measuring-wheel stands still. By very simple mechanism, and the aid of the water, in which it is more than one-half immersed, the wheel becomes a continuous measurer, and does its work without loss or mistake.

The quantity of gas which all the compartments of the meter contain being ascertained, or, in other words, the exact quantity admitted into and passed out of the wheel at each revolution being known, it only remains to provide means for recording the quantity in any given number of revolutions. A few wheels and pinions, such as are used for clock-work, effect this object. So long as the meter is in good order, and contains the proper quantity of water, all the gas which enters the house must pass through it; and that which does so pass is measured, and the quantity recorded.

Let it be understood that the meter is subject only to the directions of the person on whose premises it is fixed. It will move faster or slower, according to the quantity of gas consumed. The officers of the gas company take an account of the registrations, and see that the meter is in working order. In other respects, they have no more control over it than they have of the meat and bread, or the tea and sugar, in the customers' houses.

The dry meter differs greatly, but not essentially, from that just described. It is different in form, in some of the materials used in its construction, and in its mechanism. The wet meter is made wholly of metal—several kinds of metal. The dry meter is made partly of metal and partly of leather. A principle common to both instruments is, separate compartments of known capacities, continuous measuring, and the contrivance by which, whilst gas enters one compartment or chamber, a similar quantity passes out of that next adjoining. An uninterrupted flow of gas through the wet meter, is caused by the rotating of the wheel, which, although divided into separate chambers, has them so contrived that, whilst one is filling, the next to it is emptying, and so on successively. In the dry meter, the same object is effected in a totally different manner. The motions of the measuring-chambers are alternating—one expanding, and the next to it collapsing—yet, in such a way, that the gas passes as steadily as if its course were direct through one chamber only.

The measuring-chambers of the dry meter, being made partly of leather, are very sensitive to the impelling force (pressure) of the gas; and, by a series of levers, control the valves and work the index.

This must be sufficient as a popular explanation of each kind of meter. I shall have to say more about their internal arrangements by and bye. It is not to be expected that those who give themselves no trouble about such matters, will understand what I have written. Such persons, in common fairness, ought not to find fault by hearsay.

Whatever may have been, or still may be, the defects of gas-meters—whatever may be the occasional inconveniences, or, as some may call them, annoyances attendant upon their use—they are not so defective, nor so troublesome, as they are represented to be. In the history of the mechanical arts, has there ever been an example of an instrument which has been so practically useful, so universally adopted, or which, adapting itself to the drudgery of every-day life, has so nearly attained perfection? It is only those who know how a meter is made, and, whether wet or dry, can comprehend its principle of action, and the accuracy of its movements, who are competent to form any opinion of its value commercially.

Like every other invention which has to pass through many hands, and which is constructed according to the skill and taste of the respective manufacturers, meters, both wet and dry, differ among themselves. In each kind, there is identity of principle, but variety in the details. This is what should be wished for, and might be expected: the kind of rivalry which, keeping on the right track, leads to successive improvements. Thus it has happened that the efforts of the makers of dry meters, in which the mechanism is more delicate and facile than in the other kind, have had their good effects. Wet meters have been greatly improved, especially since it became necessary to make them in conformity with the provisions of the Sale of Gas Act.

Some meters are better than others, working more easily, causing less trouble, and being more durable. It would be something out of the ordinary course of things if it were not so. In trying to think of the number of manufacturers of meters, and of the hundreds of thousands of these instruments in use in various parts of the world, it is not very difficult to suppose that where there have been such marvellous successes, there may also have been some failures.

Now, let me say something about meters in another aspect, still looking at them fairly and impartially, but trying to find out whether they are constructed on scientific principles; good and useful as they are, whether they are susceptible of improvement. The philosophy of meter making is not what I mean; that would be too large a subject, and is not required for my present purpose. It is the science of meter making to which I am going to refer, and which, I believe, has never received the attention it deserves. The sense in which I understand and shall use this term is, the relations which the materials employed in the manufacture of meters, occupy in respect to each other. It would be of importance to know, and we ought to know, whether the various kinds of metals of which meters are made, are the best which could have been selected for the purpose; whether it has been sufficiently considered that one kind of metal is antagonistic to another, and that its presence there might not only be injurious but destructive to itself or to others.

These questions are deserving of consideration, and directing attention to them was never more necessary than at the present time. The manufacture and sale of meters are daily increasing. Very large sums of money have been expended, and still larger sums will hereafter be required, in the purchase of these instruments. Has all been done which ought to have been done in the choice of materials? Has the adaptation of metals to the passive and active parts of meters received proper attention? When it has become evident that one part, and the most important part, of a meter has been more quickly destroyed than another, what has been done in the displacement of the offending or offended metal, and the substitution of another? Put into plainer words, and which are easily understood, the question is this: have the manufacturers of meters sufficiently bestirred themselves, and done all that ought to be expected from them; and can it be said that meters are made upon truly scientific principles? If susceptible of improvements, why are they neglected or delayed? If anything can be done to add months or years to the average period of a meter's existance, is it not worth trying for?

In the fewest words possible, whilst doing all I can to avoid making the subject more difficult than it need be, let me mention a few examples illustrating the properties and habits of metals, showing how stubbornly they resist, and how readily they yield to certain influences, what are the effects produced, and, so far as we understand such things, what are the accompanying phenomena.

Take a piece of zinc, immerse it in diluted sulphuric acid, contained in a glass vessel, and attend to what happens. There is a gentle hissing noise, followed by the disengagement of small bubbles of gas, which have a pungent and unpleasant odor. Wait a little, and the piece of metal will be gone—dissolved in the liquid; from which, by evaporation and other suitable means, it can be again recovered, but, in a totally different form. The metal will be there, but not like what it once was, for it has been changed into white fine-pointed crystals—the crystals of sulphate of zinc—sulphur and zinc chemically combined.

Try a piece of iron. The process will be somewhat similar to that just described; but it will go on more slowly, and the crystals will be larger, and of a pale green color. These are sulphate of iron—sulphur and iron in chemical combination. So, also a piece of copper might be similarly treated. In this case, the crystals are of an intense blue color. Now, try a piece of lead. Do you expect to witness the same results as with the zinc, the iron, and the copper? If you do, you will be disappointed. Sulphuric acid has scarcely any preceptible effects upon lead, and for that reason it is the metal chiefly employed in lining the chambers in which the acid is manufactured.

In citing these few instances of what are called chemical action, or chemical decomposition, and which demonstrate the power which one material has over another—how it tears it to pieces, alters its appearances, and changes its properties—converting substances the most destructive and violent, into others comparatively inert and harmless, we have examples, in a small way, of what is incessantly operating throughout all nature. Changes—wonderful changes—are effected by innumerable processes; and which are as actively at work amongst all the things which man has devised, although not so impressively visible, as they are in the budding trees, the growing crops, and the ripening corn. These changes minister to man's necessities; they do more, for they are inseparable from the commercial relationships, and the social enjoyments, of the whole human family.

But it is time to go back, and talk a little more about the zinc and the other pieces of metal—instances of chemical action, and which is accompanied by the development of electricity. This is the usual form of expression; but I believe we are likely to be nearer right by saying that electrical disturbances produce chemical changes.

If we take a small piece of zinc and copper plate—say, an inch long and half an inch wide—and solder to one end of each plate a convenient length (about 2 feet) of copper wire, and place them in such a manner that they may not touch each other, in a glass of water, to which a few drops of sulphuric acid have been added, we shall have, in its primitive and most simple form, a voltaic arrangement for generating galvanic electricity. The instant the dissimilar metals are immersed in the acidulated water, they begin to influence each other;

in reality, they begin to destroy each other. It would be, in the circumstances described, a slow process—but, because slow, not the less certain. There may be no hissing noise, no ebullition of the water, no perceptible escape of gas—but there will be a current of electricity at work between the two pieces of metal. How can we know this? Nothing remarkable is seen, or heard, or felt. How can the presence of this destructive agent be revealed? No fact in physical science is more easily demonstrated. A tolerably sensitive galvanometer is all that is required. Connect each of the wires with the instrument, and the magnetized needle, which before was stationary, will begin to move—deflected to the right or left, according to the positions of the metals. This is effected by electro-magnetism—the existence of inconceivably feeble currents of electricity, being thereby made manifest, whilst we are also helped to judge a little of their relative forces or intensities.

Keeping on the track of the experiment just described, we have only to vary the conditions, and operate with other kinds of metals, and we shall get at the sort of information, relating to wet meters, which we should be anxious to possess.

Instead of placing both pieces of metal in the same glass, they may be separated—another glass being provided for the copper, and plain water only used in both glasses. By doing this, what is called the circuit will be broken, and no visible electrical effects will follow. To renew the communication, a piece of wire—say, 2 feeet long—must be used; its ends, properly cleaned, dipping into the water in each glass. The oscillations of the needle will be less violent than before, because of the distance the current has to pass through the wire. In this way, it may be more convenient to proceed than with the metals in one glass; varying the experiments, and noting the relative forces as indicated by the arcs of oscillation. Let it not be forgotton that, truthful, intelligible, and convincing as are these indications of the presence and power of a really wonderful agent, there are many precautions, and many delicate and difficult manipulations required, before we get beyond the limits of approximate results. It is only those who know something about this kind of work, who are prepared to bestow upon it the care, and patience, and watchfulness, which alone insure success.

Laying aside the pieces of zinc and copper we had been operating with, and taking others, carefully cleaned, and of the same sizes, let them be placed in common water (spring, river, or rain), and then in distilled water, noting the deflections when in one glass and in separate glasses. In the same way we may proceed with the following metals in pairs—namely, tinned iron (tin plate) against untinned iron, and with specimens of both new and old; a small piece of drum-shaft against a piece of (white metal) drum, new and old; a piece of drum-shaft against a piece of fine solder; a piece of a spout against a piece of drum-shaft. Another series of variations is necessary. Instead of common and distilled water, repeat each of the foregoing experiments with water drawn off from meters which have been at work—say, six, twelve, and eighteen months respectively. Change the order of proceeding once more, and operate in meter water, with one glass, as follows—namely, a piece of a drum against a piece of the same drum; tin plate against tin plate; solder against solder; shaft against shaft; iron plate against iron plate; cast iron against cast iron. In each of these last-mentioned experiments, after carefully observing the effects upon the needle, whilst each of the pairs of metal is as near as possible alike, let one piece of each pair be scratched with a knife, and the results noted.

Numerous as these experiments are, their number could be increased. Determinately abstaining from making known what have been the teachings of my own experiments, I am only the more anxious to set in motion right thoughts in others. There are very many persons who are interested in these investigations in a way that I never have been, and am never likely to be, and who ought to bestow upon them more consideration than they have yet received, but which they certainly demand.

It now may be asked—what is the meaning af all his? If there be currents of electricity of greater or lesser force set in motion, and kept in motion by contact or by working together of dissimilar metals, what has that to do with meters? Do you mean that these electrical currents are injurious to meters, that they, in any way, impair their efficiency or shorten their existence? I do. It is no new thought of mine that in getting together the several parts of the wet meter, and which was a work of long-continued experiments, attended by innumerable disappointments, mistakes, and failures, there probably never was a similar instance in which, of course unconsciously, so many materials, mutually antagonistic, were contrived for working so closely together. Viewed in this way, the wet meter is what might truly be called a galvanic arrangement, its most vulnerable parts being electrically opposed to, and therefore destructive of, each other.

Here, as often occurs, we have a very beautiful illustration of practical experiences greatly excelling theoretical reasonings. Notwithstanding original defects in the choice and adaptation of materials, the wet meter has done good service. Compensatory influences, such as were not suspected nor reckoned upon, came to its aid, and, in its earlier days more especially, helped to prolong its durability. It is not so now. Twenty or thirty years ago, gas-meters moved at the old road-wagon pace; they now have to move, like many other things, at express rates. When gas was 15s., 12s., or 10s. per 1,000 cubic feet, meters had an easy time of it. It is different in the present day. Many thousands of meters now do more work in an hour than their predecessors used to do in a week.*

Whatever be the causes, nothing is more certain than that wet meters wear out or are disabled in shorter periods than formerly. The costs of repairs and renewals are heavy items. This is not the worst of it. the interruptions to the ordinary course of business, the time and attention, when properly inspected, whieh meters occupy, the losses to gas companies which their being out of order occasions, and the complaints and dissatisfaction of customers, are of greater consequence than the money expended.

Can nothing be done to prevent, or at any rate to mitigate, these inconveniences? Are wet meters, in this sense, so perfect that no further improvements can be made in them? Is nothing to be suggested, by way of compensation, for the greater amount of work they have to perform? Is it not possible that by using other and better adapted materials, those which are known to be the weakest part of meters could be made the strongest? Something ought to be attempted. Wait a little. We shall see.

* It is due to the memory of the late Mr. Samuel Crosley, who did more than any other man to make the wet meter a practically useful machine, to mention here that he was not unacquainted with the effects of electricity upon the metals and metallic alloys used in his meters. During about five years, Mr. Crosley was examining, as well as could then be done, the chemical effects of gas products on metals, and in that way he decided upon what he considered best for his purpose. At a later period (1838) I was engaged for several months in conducting for him, and with him, a series of electro-magnetic experiments, similar, in many respects, to those here described. I well remember that Mr. C. often expressed surprise at results then so new and so unexpected. When completed, with his usual exactness, he reduced the experiments into a smaller space than I ever thought they would occupy; and, by a system of curves, showed wherein they agreed with, and wherein they differed from, his chemical experiments. Since the period above mentioned, I have learned a great deal more about electrical forces and phenomena than I then knew; whilst I have had the teachings as well as the warnings of an instrument so sensitive that it is influenced as readily through eight miles of interposed wire as that used in 1838 was through the same number of yards. The latter was one of the best of that day—made by the late Mr. Watkins, of Charing Cross.

*(To be continued.)*

LIGHTS OUT AT RICHMOND, VA.—One of the Richmond papers has the following:

The want of retorts at the City Gas-Works renders it necessary, for the present, to shut off supplies from the street lamps. Retorts are in preparation, we understand, and when completed will be immediately put up, and the streets will once more shine again at night. Speed the blessed light. The moon has been darkened for some nights past by clouds dark as Hades, and nocturnal pedestrians stumble, tumble, or collide at almost every step.

There is no doubt that the lights will be out all over the South before the year is up—lights moral, material, and spiritual. The sooner they shine again the better.

## USES OF PARAFFIN FOR CHEMICAL PURPOSES.

The price of paraffin keeps step with that of the other products of the distillation of coal, tar, and petroleum, and being now about as low as it will probably ever come to, there will not be wanting many important uses for it, especially in the chemical and pharmaceutical line. That it is acted upon neither by chlorine, nor by caustic alkalies, nor by acids, has given to it its name, though it may be as well to notice that the non-action of oil of vitriol refers only to the pure article, and that inasmuch as all, or very nearly all, the paraffin sold here contains a certain proportion of stearic acid, which is added for some good and some bad reasons, it will be darkened more or less by the strong acid. Some of its applications, so far as we can call them to mind at present, we will mention. A great inconvenience in chemical analysis and other manipulations is the use of oil or tallow, and metallic baths for obtaining constant temperatures higher than the boiling point of water and solution of salts—the fats on account of the production of acrolein and similar unpleasant exhalations, and the metals, as well as the salts, by the formation of crusts of oxyds, etc., on the surface. Paraffin, even when not altogether pure, will give any constant temperature up to 550° F., which can be kept up by a spirit lamp, or a gas lamp, with a contrivance like Kemp's regulator, or those little gauze caps on Bunsen's burners. It fuses a little above 100° F.; glass vessels when placed in the bath at that temperature are not liable to crack, and if it should be spilled it is not liable to grease everything it touches. The vessel used as bath is also very readily cleaned with benzole.

Filtering paper drawn through melted paraffin, left in contact with oil of vitriol, does not change. Labels on acid bottles, after being covered with a gloss of mucilage and dried, are painted over with a coat of paraffin heated somewhat above its freezing point, so as not to give too thick a coating.

Hydrofluric acid may be kept in glass bottles coated on the inside with paraffin, which coating is formed by rinsing out the dry warm bottles with paraffin and chilling it with proper care.

In place of waxed paper we know no better substitute for the purpose of covering jars and other like uses, and we should not be surprised to see it come largely in use for preserving fruit, eggs, etc., by giving it a coating sufficient to prevent the action of the atmosphere. Kobell quite lately found a novel application for paraffin in analysis for excluding the atmosphere from oxydisable solutions, such as ferrous salts, while they are manipulated. Instead of in an atmosphere of hydrogen or carbonic acid gas, a ferric solution, for instance, is placed in an open dish or beaker in contact with metallic zinc and acid, and covered with a stratum of paraffin, enough heat being applied to keep the latter fluid. Since it has no action on the permanganic solution the whole may be afterwards tested in a beaker without hindrance.

Mohr has for years used paraffin as a protection for corks that are not to be exposed to a higher temperature than the common, but to caustic alkalies and acids. The corks, well selected, are soaked in the melted paraffin as they would be in water. For glass-stoppered alkali bottles, it is likewise an excellent preventative for the fastening of the stoppers and irremediable losses.

Many other applications will suggest themselves to the practical chemist, and we shall be glad to hear more of its application in such and other directions.—*Am. Druggists' Circular.*

GAS IN SPAIN.—In the city of Madrid, Spain, the consumption of Gas has rapidly and steadily increased. The quantity of gas yearly consumed in that city since 1857, is as follows:

| | | |
|---|---|---|
| 1857..... | 1,926,000 | Cubic Metres. |
| 1858..... | 2,039,000 | " " |
| 1859..... | 2,345,000 | " " |
| 1860..... | 2,700,000 | " " |
| 1861..... | 3,074,000 | " " |

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FRIDAY, AUGUST 1, 1862.

The past fortnight presents nothing new in relation to gas-light matters. The unsettled state of public affairs, and the complications growing out of the partial reverses which have befallen the Army of the Potomac, together with the new call for 300,000 additional troops, have fully occupied the minds of the people, and rendered business questions matters of secondary importance. Large and enthusiastic meetings have been held in all parts of the country to further the enlistment of volunteers, and a liberality unparalleled in the annals of history has been exhibited in providing bounties for recruits, and in taking care of the families of our patriotic soldiers, who rush to arms for the defense of those liberties sacred to the American people. States, municipalities, corporations, and private individuals have vied with each other in subscribing means for increasing our already immense volunteer army, and a determined spirit is everywhere visible, that, let come what may, this infernal rebellion must be crushed, at whatever cost of blood and treasure; that the Union must and shall be preserved in its integrity; and that the treason of domestic foes, and the machinations of foreign enemies, must be foiled and extinguished. Count GASPARIN'S felicitous phrase, "The uprising of a great people," truly conveys to the mind the realities we every day witness; and for the time being all other questions are subservient to the great subject of National Unity, and the protection and preservation of those liberties which were sealed by the blood of our fathers, and honorably won from the proudest, haughtiest, and—shall we add?—most unscrupulous of foreign governments. With the mind of the people filled with matters of such momentous concern, it is not strange that for the nonce business should claim but a second place in the thoughts of loyal citizens, and that the far more vital question of National existence should assert its prerogative in claiming the preeminence.

The papers on the construction of reservoirs which we commence reprinting in this number of the JOURNAL, will claim the attention of those of our readers who are interested in hydraulic engineering. They are from the pen of SAMUEL MCELROY, Esq., who is widely known in his profession, and whose connection with the Brooklyn, N. Y., and other important water-works, is a guaranty of his fitness to instruct in all matters appertaining to the subject of water-supply. Probably no other subject is worthy of as thorough ventilation as that of providing cities and towns with pure and abundant supplies of water. In a hygienic point of view this subject is one of vital importance, and we fear this importance is too often overlooked. This is evident in the fact that there are many towns of quite large size in various parts of the conntry, whose population depend solely on pumps and wells for their daily supply of water, and the water thus obtained is too often contaminated by the proximity of cesspools and other reservoirs of impurity. We have before reverted to the impurity of well-water in large cities, and quoted the opinion of Dr. LETHEBY, of London, to sustain our views. The same strictures may apply to towns which have not yet arisen to the dignity of cities, where the sources of water are liable to the same contamination, although, perhaps, not to the same extent. In the list of post-office towns we have been publishing, to show where gas-works and water-works are wanted, there are several states where *no* water-works are in existence; and in some towns where rude provisions have been made for obtaining a water-supply, the "works" have been constructed with a total disregard of the principles of hydraulic engineering, and very little or no attention has been paid to the possible wants contingent upon future increase of population. These remarks apply with peculiar emphasis to older towns, which have grown up slowly, and not to the newer cities—particularly those of the great Northwest—where, in most instances, ample provision has been made for water-supply; the projectors of these cities being convinced that the true way to promote their growth, is to render them above criticism in whatever may conduce to a sound sanitary condition. Mr. ANTHONY TROLLOPE, in his recent work on America, mentions this condition as being attained in the greater part of our western cities, and commends the attention paid to the three great subjects of gas, water-supply, and sewerage, wherein our new towns possess an incomparable advantage over the older cities. We are very sorry to say that the city of New York is not as bountifully supplied with water as it should be. In many parts of the city it is impossible to draw the Croton water during several hours of the day, on the second floors of houses; and as for greater elevations, the water seldom or never rises as high as it should. With all the blessings the introduction of the Croton has afforded, it has not accomplished [what it might have done, had the reservoirs and distributing pipes been adequate to supply the present demand, which ought to have been anticipated many years ago. Fortunately the construction of the new reservior in the Central Park will tend to obviate a portion of this difficulty; and although it may not be sufficiently elevated to send the water in the upper stories of dwellings, it may, at least, enhance the supply in other places where a deficiency has been noticed.

The provisions of the tax-bill soon go into effect, and gas-companies will be called upon to assist in sustaining the burden of the war. We hear various speculations as to the course they will see fit to pursue, and some are found who prognosticate increased prices, and a depreciation in quality of gas. But we do not regard either of these results as probable. The officers and managers of gas-light companies have common sense enough to see that such a short-sighted policy would be the veriest folly. That there may be exceptional instances, we do not doubt; but we are firmly convinced that the great majority of companies will continue to make a good quality of gas, and supply their consumers as heretofore, regardless of the diminished profits they will receive. This is the only wise policy—particularly in view of the substitution of other illuminators which might be adopted if a different course were pursued. Many companies now feel the effects of the consumption of kerosene oil, and to act in the way which has been predicted of them, would only be to open wider the doors of competition, as well as to alienate the well-wishes of customers whose good opinion is worth regarding.

BAD ODORS IN NEW YORK.—A communication has appeared in one of the morning papers, complaining of some impurity in the atmosphere in that portion of this city situated to the eastward of Union Square. An item in the same journal says:

"One traces the nasty phenomenon to the 'great purifying house of the Manhattan Gas-Works, wherein the gas is passed through lime, etc.,' and asserts that the whole vicinity is *constantly* poisoned by the fumes. Another says that the stench proceeds from the sewers which empty into the East River in the vicinity of Sixth and Eighth streets. These sewers have become filled with mud and other material, until the water flows into the streets through the sewer openings, filling the gutters with a black and filthy liquid, which lies in the hot sun until it evaporates, poisoning the atmosphere and scattering the seeds of disease and death broadcast over the city. There is evidently a combination of causes in the production of the offensive result."

We fancy if the contractor for cleaning streets would attend to his work, the cause of the difficulty would be removed. The idea that the foul smell comes from the gas-works is idle gossip. The odor has been but recently complained of, while the gas-works have been in operation for years, and so far have not disturbed the sanitary condition of the city in the slightest degree.

WOOD-GAS.—A very beautiful gas made from pine wood may now be seen at the Cremorne Gardens, in Fourteenth street in this city. The apparatus in which this gas is generated, is the invention of Mr. Mark Levy, to whose advertisement, in another column, attention is called. It is said that the bye products from the distillation of wood, such as tar, pyroligneous acid, &c., are sufficient to pay the whole expense of the process, thus leaving the gas clear profit to the manufacturer. The retort of Mr. Levy is of a peculiar construction, containing re-heating cells, by which a larger amount of gas can be obtained than in the plain retorts of the old shape.

HEATING CHURCHES BY GAS.—The *Journal fur Gasbeleuchtung* announces that in a number of churches in Germany, gas is successfully employed for heating purposes, particularly in Hamburg and Berlin. The principal advantages of this mode of warming, consist in the prompt production of heat, and the facility with which the temperature may be regulated by increasing or diminishing the supply of gas, in the absence of danger from fires, and in the fact that no chimneys are necessary.

THE MANUFACTURE OF GAS IN THE UNITED STATES.—The manufacture and consumption of gas, for illumination and other purposes, which is one of the remarkable fruits of chemical science, has been greatly increased, not only in our northern cities, but in the large towns and villages throughout the Union. The quantity returned, in the census of 1860, is but four thousand million feet, of the value of eleven million dollars, but the whole quantity made exceeded 5,000,000,000 cubic feet, the value of which was about thirteen millions of dollars.

THE RAILROAD TO OIL CREEK.—The Oil Creek Railroad is being pushed along with great rapidity. The Jamestown, N. Y., *Journal* thus alludes to this important work, which is designed to carry large quantities of petroleum to market:

"We were surprised to hear from a reliable source the rapid progress that is being made on this road, which is to connect with the Atlantic and Great Western and the Philadelphia and Erie railroads with the oil regions of Pennsylvania.

"The necessity for such a road has existed for some time. The immense supply of oil, and the increased demand for it, stimulated a few energetic individuals to engage in this enterprise, and they have pushed the work forward with wonderful rapidity. Already is the grading completed and ready for the iron to Spartansburg, a distance of nine miles from its junction with the Atlantic and Great Western and Philadelphia and Erie Railroad at Corry, and it is nearly finished to Centreville, to which point the iron will be laid by the 1st of September, and the road finished to Titusville by the 1st of October, a distance of 27 miles."

## ANSWERS TO CORRESPONDENTS.

G. F. T., of N. Y.—*We presume the promoters of the company are laying on their oars awaiting the arrival of better times. We have heard nothing in reference to the enterprise for some time.*

L. E. P., of Mass.—*Hughes' work is well adapted to your wants, and will give you a large amount of practical information. We believe there is no American reprint of the book, but the English edition is sold at a very low price.*

B. H. B., of Ky.—*Your remarks are noted, and will be attended to. In the meantime, we advise a repetition of your experiments, for we are inclined to believe you are wrong in your deductions.*

J. P., of Pa.—*Bowditch's clay patent for purifying gas was claimed by its inventor to entirely remove bisulphide of carbon; but we believe it is not efficacious for this purpose. Some of the ablest gas chemists in England experimented with it, and pronounced it worthless.*

E. W. F., of Del.—*No one has a right to patent the simple generation of gas from petroleum. The process you speak of must have had some other claims to originality—perhaps in the apparatus employed, or in some peculiar combination. Petroleum may be converted into gas as readily as any other hydro-carbon.*

C. F. L., of Ohio.—*We have a very few copies of our first volume left. It is almost out of print. Vol. 2, ditto.*

A. S., of Ill.—*We have not heard from the Water Gas-Works at Aurora, Ind., since June of last year, and do not even know whether they are in operation.*

P. P. F., of N. Y.—*You can see it in operation at White Plains, N. Y.*

THE IRON TRADE OF PHILADELPHIA.—The iron manufacturers and dealers of Philadelphia, being convinced of the necessity of a reform in giving credits in their trade, issued a circular to the numerous dealers in this metal in various States, asking their co-operation in establishing credits of four instead of six months in all purchases of iron. In pursuance of the circular, a meeting of iron merchants was held at the Board of Trade Rooms in Philadelphia on July 15th, at which a large attendance was secured, the most important furnaces, rolling mills, and dealers being represented. Among the parties to the movement were several well-known makers of retorts and other gas apparatus. The following preamble and resolutions were fully discussed and adopted:

"*Whereas*, A reform in the credit system of the iron trade is desirable for the interest of the consumer as well as of the manufacturer and dealer; and whereas, concert of action is necessary to consummate the same: it is therefore resolved—

"*First.*—That the credits on sales on and after the first of August, 1862, be reduced to four months.

"*Second.*—That sales for cash should in all cases be held to imply a settlement within ten days.

"*Third.*—That the discount for cash should not exceed four per cent.

*Fourth.*—That settlements of bills, whether by cash or note, shall be made in currency equal in value to the United States legal tender notes.

"*Fifth.*—The foregoing resolutions are recommended by this meeting as a rule of action for the iron trade, and the individuals and firms consenting thereto pledge themselves that they will give these resolutions their united and hearty support.

"*Sixth.*—That the proceedings of this meeting be published, and copies sent to all members of the trade."

We regard this movement on the part of the iron trade as eminently proper, and one which other branches of business would do well to follow.

ODOR OF ILLUMINATING GAS.—M. Bertholet, who has lately read before the Academy of Sciences of Paris, a memoir on acetylene in illuminating gas, says, that of the odors of gas that of acetylene is the most characteristic. Four substances give gas its peculiar odor. These are, acetylene, sulphide of carbon, benzine, and naphthaline. By mixing acetylene with a few traces of sulphuretted hydrogen, the odor of illuminating gas is distinctly recognizable.

GAS IN FRANCE.—The new municipal gas-works of the city of Rouen, France, are approaching completion, and already supply a number of consumers. In 1859 but about 850 burners were supplied with gas, while in 1862 the number will be about 2,000.

## PETROLEUM.

The following remarks on petroleum and coal-oil are from the pen of Mr. Kennedy, Superintendent of the Census Bureau:

An important development of the natural resources of the country and a valuable addition to its exports have been made by the discovery, within two or three years, that certain indications, known to the aboriginal and early European inhabitants of the western country, of natural reservoirs of inflammable oil existing upon the head waters of the Alleghany river, in New York and Pennsylvania, were but the clue to apparently inexhaustible supplies of native oil, accessible at no great depth throughout an extended belt of country, embracing the bituminous coal measures of several States.

Petroleum, rock, or mineral oil, a natural product of the decomposition of organic matter, emitted from the soil in various formations, particularly those of rock salt, was known and employed to some extent by the ancients, having been mentioned by the Father of History twenty-three hundred years ago, and by Greek and Roman writers of later date. In its more fluid form, as found on the shores of the Caspian Sea, near the Irawaddy of Burmah, in Italy, and some parts of our country, it has borne the name of naphtha, while the more solid elements of the same substance predominated in the articles known as asphaltum and bitumen, found abundantly in the great Pitch Lake of the Island of Trinidad, near the Dead Sea in Judea, and elsewhere. Petroleum is nearly identical in properties with the artificial oils which have been long derived from the destructive distillation of different minerals, as cannel coal and brown coal, or lignite, bituminous shales, sands, clays, peat, &c., which have been the subject of numerous patents in Europe and America, and within the last eight years have been manufactured to a considerable extent in the United States and the neighboring provinces, until the native petroleum springs opened a source of cheaper supply.

As a product of our own country this remarkable substance was brought to the notice of the white population as early as the middle of the last century, by the Seneca Indians, who found it upon Oil creek, a branch of the Alleghany, in Venango county, Pennsylvania, and near the head of the Genesee river, in New York, whence it received the name of "Seneca oil," and "Genesee oil." It was used by the natives in their religious ceremonies, and as medicament for wounds, &c. For the last-named purpose it has been long collected, and sold in small quantities at a high price. A perennial flow of oil has been known to exist in Oil creek, above referred to, for a century. For the last forty years the spring has been enclosed in a vat or structure of wood and stones, which was daily skimmed by the proprietor, and made the source of considerable revenue. We have seen extensive diggings in this region, made by the French more than a century since, while that nation held the valley of the Mississippi, which were evidently made to ascertain the basis or source of what, no doubt, impressed the French officers as a most interesting and curious development of the bounty of nature. Petroleum, doubtless, formed an article of considerable traffic between the Indians and traders of that region, as we have seen, in some old account books of the last century, "gallons" and "kegs" of Seneca oil credited to the Indians.

### OIL MINES OF PENNSYLVANIA.

Its existence in any vast amount appears to have been unknown until 1845, when a spring was "struck," while boring for salt, near Tarentum, thirty-five miles above Pittsburg, on the Alleghany. Experiments having proved its constituents to be nearly the same as those of the artificial carbon oil, a company was organized in New York to attempt its purification by the same process applied to the latter. But little was effected, however, and in 1857 Messrs. Bowditch & Drake, of New Haven, commenced operations at Titusville, on Oil creek, where traces of early explorations were found, and in August, 1859, a fountain was reached by boring, at a depth of seventy-one feet, which yielded four hundred gallons daily. Before the close of the year 1860, the number of wells and borings was estimated to be about two thousand, of which seventy-four of the larger ones were producing daily, by the aid of pumps, an aggregate of eleven hundred and sixty-five barrels of crude oil, worth, at twenty cents a gallon, about ten thousand dollars. Wells were soon after sunk to the depth of five or six hundred feet, and the flow of petroleum became so profuse that no less than three thousand barrels were obtained in a day from a single well, the less productive ones yielding from fifteen to twenty barrels per diem. In several instances extraordinary means were found necessary to check and control the flow, which is now regulated in such wells, according to the state of the market, by strong tubing and stop-cocks. The quantity sent to market by the Sunbury and Erie Railroad from the Pennsylvania oil region, which has thus far been the principal source, increased from 325 barrels in 1859 to 134,927 barrels in 1861. The whole quantity shipped in the last mentioned year was nearly 500,000 barrels. Since August, 1861, the product has rapidly increased. The present capacity of the wells is estimated at 250,000 to 300,000 barrels per week. So important, however, have the operations in this article become, that a railroad, we understand, has been chartered in Pennsylvania exclusively for the transportation of the oil to market. From a recent number of the *Register*, a newspaper published in Titusville, Pennsylvania, we copy the following statement respecting the production of petroleum in that vicinity: "We learn that the number of wells now flowing is seventy-five; the number of wells that formerly pumped and flowed is sixty-two; the number of wells sunk and commenced is 358; total, 495. The amount of oil shipped is set down at 1,000,000 barrels; amount on hand to date, 92,450 barrels; present amount of daily flow, 5,717 barrels. The average value of the oil, at $1 per barrel, is $1,092,000; average cost of wells, at $1,000 each, is $495,000; machinery, building, &c., from $500 to $700 each, $500,000. The total number of refiners is twenty-five. The detailed report of the condition of the wells shows that production is on the increase. Holders are firm at fifty cents per barrel at the wells, and don't seem to care about selling any great amount at that price." With increased facilities for getting it to the seaboard at a cheaper rate for transportation, the operations will doubtless become much more extended than at present.

The exportation of crude and refined petroleum from the principal Atlantic cities to Europe, South America, and the West Indies, has already become considerable, the larger proportion being shipped to England. Much of it is sent to Europe in this crude state, in which form it is said to be preferred for the sake of the collateral products obtained in the process of refining. It is probable, however, that the highly inflammable character of the unrefined article, owing to the presence of certain gaseous, or exceedingly volatile compounds, may prove an objection to its shipment in that state. The quantities exported from the cities of Philadelphia, New York, Boston, Baltimore, and San Francisco, from the 1st of January to the 1st of April, 1862, amounted to 2,342,042 gallons, valued at $633,949. The receipts at Cincinnati, during the same period, of carbon and petroleum oils, were 519,960 gallons, or 13,000 barrels, nearly one-half of which was petroleum oil. The exports from the three cities first mentioned, from the 1st of January to the 16th of May of the present year, were 3,651,130 gallons, worth $889,886, and the shipments in the last week of that period from the same places were 255,600 gallons, valued at $42,160.

A large reduction has taken place in the price since the commencement of the trade, and particularly during the last few months. The price of crude petroleum in Philadelphia on the 4th of January, 1862, was from 22½ to 23 cents a gallon, and of refined oil 37½ to 45 cents. On the 29th of March the prices had declined at the same place to 10 and 12 cents for crude, and 25 to 32 cents for refined oil, while the most recent price current lists place it at 9 and 19 cents. Although the capacity of the existing wells already exceeds a profitable demand, there appears to be no assignable limit to the flow, or to the localities which may be found to yield it, whenever an augmented demand shall warrant further search or increased production. The bituminous coal areas of the United States are estimated to cover upwards of 62,000 square miles in eight of the Middle, Southern, and Western States. Springs and reservoirs of petroleum have been discovered throughout nearly

their whole extent. They have also been noticed by Captain Stansbury on a branch of the Yellow creek, eighty-three miles from Salt Lake City, in Utah, on the route to Fort Leavenworth. They exist also in some of the neighboring British provinces. It is probable that the saliferous strata of our western country may be generally found to yield this interesting mineral product.

The importance of this article is not limited to its value as an item in the export trade of our cities. Attention appears to have been first directed to it on account of the demand for a safe and cheap material for illumination, in place of the dangerous compounds of turpentine and other explosive hydro-carbons, as well as for lubricating purposes, in which it has proved to be a valuable substitute for animal oils. There is no doubt that the various other uses of crude petroleum, or its constituents, will render it a valuable acquisition to the arts. Ths business of refining the raw product, in order to remove from it all corrosive and volatile elements, already employs a number of establishments, and will become one of some magnitude. Practical chemistry is daily adding to the number and variety of uses which the substances eliminated in the process of rectification may be made to subserve in the arts.

Although the extraction of oil, pitch, and tar from bituminous shale was the subject of a patent in England as early as 1695, and the manufacture and purification of oil, gas, and other hydro-carbons from coal received several improvements by the Earl of Dundonald and others at a later period, the patent of Mr. Young, of Manchester, secured in England in 1850, and in the United States in 1852, "for the obtaining of paraffine oil, or an oil containing paraffine, and paraffine from bituminous coal," appears to have given the first great impulse to the manufacturing of these oils as a source of artificial light. The patent, which covered a very successful process, has given rise to suits of law, one of which was recently brought, without success, to restrain the sale in England of petroleum oils, by the name of American paraffine oil, as damaging to the sale of his "paraffine oil," on account of the highly inflammable character of the former.

ILLUMINATING OIL FROM COAL

appears to have been made as early as 1846 by Dr. Gesner, of Nova Scotia, and in 1854 the Kerosene Oil Company, on Long Island, commenced the first manufacture of carbo-hydrogen oil under patents secured by Dr. Gesner, using cannel coal from England, New York, and other parts of the United States. The Breckenridge coal-oil works on the Ohio, at Cloverport, Kentucky, were commenced in 1856, and were soon followed by others, to the number of twenty-five in operation in 1860 in Ohio alone, with a working capacity of three hundred gallons of light oil each, per diem. There were then about fifty-six factories in the United States, exclusive of some fifteen engaged altogether on petroleum, and several small private coal-oil works. The capital expended in coal-oil works and cannel coal mines was estimated at nearly four million dollars. The manufacture of coal-oil lamps, resulting from the use of the oil, formed the principal business of sixteen companies, who employed 2,150 men and 400 women and boys, and work for 125 looms in making the lamp-wick.

The cannel coal employed by them, as well as wood, peat, and other substances of vegetable origin, when subjected to destructive distillation in close vessels, at a heat below that at which they yield gas in abundance, affords a large quantity of a light supernatant oil, amounting to about one-fifth of the product, which, having been purified and re-distilled, yields a very volatile and naphthalous fluid of light specific gravity, containing some paraffin oil, and being highly inflammable owing to the presence of benzine or benzole. There is also obtained a heavier oil, which is a safe and valuable burning oil, a denser lubricating oil, and solid paraffin, a peculiar white crystalline substance, beautifully adapted for candles, and now manufactured to some extent for that and other practical uses. The petroleum of our country has been found to be a more economical source for these several compounds of carbon and hydrogen, and enables the manufacturer to dispense with the first stage of the process referred to. The cheapness of crude petroleum, and the simple and comparatively unexpensive process by which a safe and economical illuminating oil may be obtained, give an unusual interest to this subject, as affording the means of preventing the great loss of life shown by the recent census to result from the dangerous compounds so extensively used for that purpose. Although the petroleum oils, when imperfectly rectified, so that all the benzole has not been expelled, are exceedingly explosive, owing to the heat generated by the combination of the solid paraffin readily vaporizing and igniting the more ethereal portion, it may with great facility be freed from all volatile substances, and a very simple and practical test enables the purchaser to ascertain its fitness for use. The precautions required in the treatment of petroleum, as well as the expense of thoroughly purifying it, being somewhat greater than with coal oils, many are tempted to neglect it, or even to add a portion of the lighter and cheaper oil to make the heavy oil burn more readily.

All these oils possess an advantage over other kinds in the fact that when once properly deodorized they do not become rancid or ferment by keeping, but rather loose by age any odor they may have retained.

Of eight several products obtained from petroleum by chemical analysis, two or three only were solidified by cold of fifteen degrees below zero, the first three or four remaining perfectly fluid, and none possessed corrosive qualities, showing their fitness as lubricators. Experiments have shown that crude petroleum is admirably adapted to the manufacture of gas, and have led to the expectation that its use will greatly reduce the cost of its manufacture, if it does not entirely supersede the use of coal for that purpose. The "carburation of gas," by attaching to the gas-burner a reservoir of oil, through which the gas is made to pass before combustion, has been found greatly to increase the economy and illuminating power of coal-gas.

The various collateral and residuary products of the distillation, which have been generally wasted heretofore, will all doubtless be utilized as the progress in analytical and technical chemistry throws more light upon their nature and relations. Several of them are already employed in Europe, if not in this country, in the manufacture of some of the new and beautiful dyes which practical science has recently introduced in the arts. Benzine, which it is the object of the rectifier to eliminate, is used, to some extent, as a flavoring material, though some recent facts make it doubtful if it is wholly innoxious to the health.

The acids, caustic alkalies, and other materials used in the purification of the crude qualities of petroleum may all be restored to use or employed as fertilizers, and the dense, pitchy liquids obtained in the manufacture are available in the composition of water-proof cements, roofing, varnish, and fuel. The absence of fatty acids may possibly prevent the saponification of these oils with alkalies for the manufacture of soap, but the more extended use of petroleum for the purposes we have named, which will be effected by time and improved manipulations of the article, will suffice to render it a most valuable acquisition to the raw materials and manufactures of the country.

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Gas in Scotland. — We learn from the London *Builder* that the Hawick Gas Company have declared a dividend of 7½ per cent. on their original shares, and reduced the price of their gas from 6s. 8d. to 6s. 3d. The chairman of the annual meeting wished to make the gas cheaper, but some of the directors erroneously argued as if a reduction of price were equivalent to a reduction of dividend, and hence resisted the chairman's proposal.

The Kelso Gas Company have declared a dividend of 10 per cent. on their paid up capital, and reduced the price of their gas from 7s. 6d. to 6s. 8d.

The Elgin Gas Company have declared a dividend of 6 per cent., and a reduction of price to 8s. 6d. and 7s. 6d. according to locality.

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Danger of Benzine.—The fire at Hegeman & Co.'s drug store, on Broadway, New York, a few evenings ago, was caused by the vapor of benzine igniting near a gas-light. A bottle of benzine was dropped near the light, when the vapor immediately took fire, and caused the destruction of a large portion of the stock.

## A BILL FOR THE SAFE-KEEPING OF PETROLEUM.

The subject of the safe-keeping of petroleum seems to have exercised the minds of the people of London to an extent equal to the excitement created by it on this side of the Atlantic. The following bill has been enacted by Parliament regulating the storage and transportation of petroleum:

PREAMBLE.

Whereas, it is expedient to provide for the safe-keeping of petroleum and certain products thereof that are dangerous to life and property, from their properties of giving off inflammable vapors at low temperatures, or of igniting on the application of light to their surfaces: Be it enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

INTERPRETATION CLAUSE.

I. "Petroleum," for the purposes of this Act, shall include any product thereof that gives off an inflammable vapor at a temperature of less than one hundred deegrees of Fahrenheit's thermometer:

"Borough" shall in England mean any place for the time being subject to the provisions of the Act of the session holden in the fifth and sixth years of King William the Fourth, chapter seventy-six, intituled "An Act to provide for the Regulation of Municipal Corporations in England and Wales;" and in Scotland any royal burgh and any of the burghs or towns returning or contributing to return members to Parliament; and in Ireland any place for the time being subject to the provisions of the Act of the session holden in the third and fourth years of Her Majesty, chapter one hundred and eight, intituled "An Act for the Regulation of Municipal Corporations in Ireland:"

"Harbour" shall include any port, dock, navigable river, pier, or other works in or at which vessels ship or discharge goods or passengers:

"Harbour authority" shall include all persons or bodies of persons, corporate or unincorporate, being proprietors of or intrusted with the duty of improving, maintaining, or managing any harbour.

REGULATIONS TO BE OBSERVED BY A SHIP CARRYING PETROLEUM.

II. Every vessel carrying a cargo consisting wholly or in part of petroleum on entering any harbour shall conform to such regulations in respect to the place at which she is to be moored as may from time to time be issued by the harbour authority having jurisdiction over such harbour. If any vessel is moored in any place in contravention of such regulations, the petroleum carried therein shall be forfeited, and the owner of the vessel shall incur a penalty not exceeding *twenty pounds* for each offence.

REGULATIONS TO BE OBSERVED IN STORING PETROLEUM.

III. Not more than *twenty-five* gallons of petroleum shall be kept within *one hundred* yards of a dwelling-house or of a building in which goods are stored, except in pursuance of a licence given by such local authority as is hereinafter mentioned.

Any petroleum kept in contravention of this section shall be forfeited, and, in addition thereto, the occupier of the place in which such petroleum is kept, and the owner or person having the charge of the petroleum, shall each incur a penalty not exceeding *twenty pounds* a day for each day during which petroleum is kept in contravention of this Act.

DEFINITION OF LOCAL AUTHORITY.

IV. The following bodies shall respectively be the local authority to grant licences under this Act in the districts hereinafter mentioned—that is to say:

1. In the city of London, except as hereinafter mentioned, the mayor, aldermen, and commons, by the council:
2. In any borough, except as hereinafter mentioned, the mayor, aldermen, and burgesses, by the council:
3. In any place, except as hereinafter mentioned, within the jurisdiction of any trustees or improvement commissioners, appointed under act of Parliament, the trustees or commissioners:
4. In any harbour within the jurisdiction of a harbour authority, whether situate or not within the

jurisdiction of any local authority hereinbefore mentioned, the harbour authority, to the exclusion of any other local authority.

5. In any place in which there is no local authority as hereinbefore defined, the justices in petty sessions assembled.

MODE OF GRANTING LICENCES.

V. Licences in pursuance of this Act, may be granted under the hands of two or more of the persons constituting the local authority. There may be annexed to any licence under this Act any conditions which the local authority thinks necessary for diminishing the risk of damage from explosion or fire; and any licencee violating any of the conditions of his licence shall be deemed to be an unlicensed person.

IN CASE OF REFUSAL OF LICENCE, THE APPLICANT MAY MEMORIALIZE SECRETARY OF STATE.

VI. If, on any application for a licence under this Act, the local authority refuses to licence, or grants the same only on conditions with which the applicant is dissatisfied, the local authority shall, if required by the applicant, certify in writing under the hand or hands of one or more of the persons constituting the local authority the grounds on which it refused the licence or annexed conditions to the grant thereof, and shall deliver the certificate to the applicant, who may thereupon, within *ten* days from the time of the delivery thereof, transmit the same to one of Her Majesty's principal Secretaries of State, if the application is for a licence in England or Scotland, and to the Lord Lieutenant or other chief governor if the application is for a licence in Ireland, together with a memorial, praying that, notwithstanding such refusal, the licence may be granted, or that such conditions may not be imposed, or may be altered or modified in such manner and to such extent as may be set forth in such memorial; and it shall be lawful for the Secretary of State, Lord Lieutenant, or other chief governor, if he thinks fit, on consideration of such memorial and certificate, and if he thinks it necessary or desirable, after due inquiry from and a report by such person as he may appoint for that purpose, to grant the licence prayed for, either absolutely, or with such conditions as he thinks fit, or to alter or modify the conditions imposed by the local authority; and the licence so granted, or altered and modified, as the case may be, when certified under the hand of the said Secretary of State, Lord Lieutenant, or other chief governor, shall be to all intents as valid as if granted by the local authority.

FORFEITURES AND PENALTIES RECOVERABLE SUMMARILY.

VII. Any forfeiture or penalty for an offence against this Act may be enforced upon summary conviction before any two justices, or in Scotland before any sheriff; and *one moiety* of the forfeiture and penalty shall belong to Her Majesty, and the *other moiety* to the informer, unless the informer is a servant of the person informed against, in which case *the moiety* of the forfeiture or penalty which would otherwise belong to the informer shall be applied in such manner and to such other purposes as the justices or sheriff in their or his discretion may think fit.

FORFEITURES AND PENALTIES IN SCOTLAND MAY BE LEVIED BY POINDING AND SALE.

VIII. In Scotland forfeitures and penalties under this Act, and the expenses of conviction, may be levied and recovered by poinding and sale, and, in default of payment or of sufficient poinding, by imprisonment for any period not exceeding *three months*.

SEARCH FOR PETROLEUM.

IX. Petroleum may be searched for in the same manner, under the same warrants, and subject to the same conditions in, under, and subject to which gunpowder may be searched for, in pursuance of the Act passed in the session holden in the twenty-third and twenty-fourth years of the reign of her present Majesty, chapter one hundred and thirty-nine; and all the provisions of the said Act relating to searching for gunpowder shall be construed as if the word "gunpowder" in such provisions included petroleum, as defined by this Act.

RESERVATION OF PREVIOUS POWERS WITH RESPECT TO INFLAMMABLE SUBSTANCES.

X. All powers given by this Act shall be deemed to be in addition to and not in derogation of any other powers conferred on any local authority by Act of Parliament, law, or custom, and the local authority may exercise such other powers in the same manner as if this Act had not passed; and nothing in this Act contained shall be deemed to exempt any person from any penalty to which he would otherwise be subject in respect of a nuisance.

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WATER SUPPLY OF CALCUTTA.—The London *Builder* says that Mr. W. Clark, C. E., the engineer to the Municipal Engineers of Calcutta, has prepared a scheme for supplying the town with water, on which he has reported to the commissioners for submission to the Government, who has set apart a certain fund in aid of water supply. The engineer, in his report, proposes a scheme with various modifications, for bringing water from Pulta Ghat. He says:—"I believe it will be found quite possible, so far as the levels are concerned, to bring the water from Pulta Ghat direct to (the pumping station at) Wellington Square, through a covered brick culvert. A double culvert 4 feet 3 inches in diameter, with a fall of 6 inches per mile, if constantly running 3 feet 2 inches deep, would bring down to Calcutta the full quantity, 12,000,000 gallons per day. Such a culvert, 13 miles long, at the depth stated, would contain 9,500,000 gallons, and would in fact, be a storage reservoir in the event of any stoppage occurring at the Pulta end of the works. The cost of such a double culvert would be 12 lakhs of rupees."

One of the engineer's estimates is as follows:

| | Rupees. |
|---|---|
| Works at Cossipore, 24-inch main to Wellington Square | 9,63,892 |
| Land and engines at do. | |
| Cost of 36½ miles pipes, &c. | 4,00,000 |
| | 13,63,892 |

Lower estimates, on modifications of the full scheme, are given. The works would occupy two years in construction.

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## PATENTS.

### UNITED STATES

35,552.—Albert Taplin, of Providence, R. I., for Improved Burner for Coal-Oil Lamps:

I claim turning the rim of the cone upward at, A A, and outward at B B.

35,577.—W. D. Andrews, of New York City, for Improved Reciprocating Pump:

I claim the compound piston, or one formed of two parts, D D', each provided with a valve, E, in combination with the partition or abutment, B, in the pump cylinder, A, the water passage, F, and the induction and eduction openings, H G, when arranged to operate as and for the purpose set forth.

35,578.—S. L. Avery, of Norwich, N. Y., for Improvement in Water Elevators:

I claim the annular outer flanch, a, and the interior ratchet wheel, b, which respectively project from the outer face of the metallic head, E, of the windlass shaft, when the said parts have substantially the proportions, and are used in the manner and for the purpose set forth.

I also claim the jointing of the branched crank lever, F, with the movable head, D, when the said head is combined with the rigidly secured head, E, of the windlass shaft, in such a manner that the ratchet tooth, c, on the branch arm, k, of said crank lever, can be made to operate in conjunction either with the ratchet wheel, b, or the annular flange, a, of the aforesaid head, in the manner set forth.

I also claim the arrangement of the forked holder, g, the spring, h, and the branch arm, j, of the jointed crank lever, F, with each other, and with the head, D, and the annular groove near the end of the windlass shaft, substantially in the manner and for the purpose set forth.

I also claim the arrangement of the hook headed pall, n, with the metallic head, D, when the said head is jointed to the branched crank lever, F, and when these said parts are combined with the head, E, of the windlass shaft, substantially in the manner set forth.

35,579.—Henry Behn, of New York City, for Improvement in Coal-Oil Lamp:

I claim the arrangement of the gas chamber, d, between the upper and lower wick tubes, n and b, in combination with the tubes or pipes, m m, in the manner and for the purpose substantially as described.

Secondly, I claim the construction of the upper end of the gas chamber, d, forming the upper wick tube, n, provided with a wedge, p, or its equivalent, in the manner and for the purpose specified.

35,598.—W. L. Fish, of Newark, N. J., for Improved Attachment to Lamp Chimneys:

I claim, first, A lamp chimney, A, provided with a receiver, B, substantially as and for the purpose shown and described.

Second, The arrangement of the window, e, in the metal bulb a, of a chimney, A, as and for the purpose set forth.

35,604.—W. H. Guild, of Brooklyn, N. Y., for Improvement in Rotary Pumps:

I claim the wheel, G, composed of a series of spiral arms or flanches, g, connected with a rim, f, in combination with the cylindrical case, A, having two different diameters to form a shoulder or bearing, b, for the wheel which, with its shaft, E, is fitted within said case, substantially as and for the purpose set forth.

35,606.—W. E. Hatfield, of Newark, N. J., for Improvement in Odor Traps for Sinks, &c.:

I claim the odor trap having a valve at such an acute angle as to require but slight pressure to close or open it, when constructed, substantially in the manner and for the purpose specified.

35,609.—Remi Henry, of Morrisania, N. Y., for Improvement in Pumps:

I claim the arrangement of the partitions, c c, with the cylinder, B, pipes, a b, and the shell, A, in the manner shown and described.

35,610.—L. L. Hill, of Hudson, N. Y., for Improvement in Making Illuminating Gas:

I claim the combination of wood gas, the hydrogen of water, and the gas of paraffin oil, or the same combination with any other oil gas, or the gas obtained from bituminous coal, when effected in the manner substantially as described.

And I claim the methods described for producing and uniting the same with a view to convenience, efficiency, and economy.

35,644.—Job T. Williams, of Philadelphia, Pa., for Improvement in Lamp Reflectors:

I claim the reflector, composed of the outer concave rim, a, and central convex projection, b, and having radial ribs or corrugations, the whole being constructed and arranged, as and for the purpose set forth.

35,649.—Merwin Fowler (assignor to Edward Miller), of Meriden, Conn., for Improved Spring Catch for Lamp Chimneys:

I claim the combination of the hook, C, and spring, d, applied to the lamp top, or burner, substantially as and for the purpose set forth.

35,655.—Charles C. Stansell, of Middleboro', Mass., assignor to himself and A. W. Rockwood, of Newton, Mass., for Improvement in Lamps:

I claim combining and arranging with the wick, the wick tube, B, and the flame adjuster, H, of a lamp, in manner substantially as described, a vapor intercepter, F, and conduit or passage, G, the same being substantially as and for the purpose above explained.

I also claim combining and arranging with the flame adjuster and the vapor interceptor and conduit, as described, a heat insulator or insulating vapor reservoir, I, made of a material and so as to operate in manner, and for the purpose, substantially as specified.

35,660.—H. F. Adams and William Berry, of Syracuse, N. Y., for Improvement in Kerosene Lamp Burners:

We claim the combination of the large concave flange, F, and conical air-chamber, A, having bottom openings as described, with the small concave flange, R, inclosed within the cap, C, and said flange, R, being constructed with peculiarly-formed centre and outside openings as specified, and the whole being combined and arranged specifically as described, and for the purposes set forth.

35,664.—James R. Baker, of Kendallville, Ind., for Improved Mode of Removing Chimneys and Filling Lamps:

I claim the attaching of the annular plate, D, which has the cone or deflector, E, and draught chimney secured to it, to a sliding tube, C, fitted in the burner, A, and provided with a hole or opening, b, substantially as shown, to serve the double purpose of a guide and filling tube, and admit, by the raising of the tube, the wick being lighted and the lamp filled, without detaching the chimney from the burner or the burner from the lamp, as set forth.

35,675.—Edward S. Gaylord, of Hartford, Conn., for Improvement in Mica Chimneys for Lamps:

I claim as a new and improved article of manufacture, a mica chimney for lamps, &c. The combination of mica, a, from compression rings, c, and a lateral joint bar, b, or double-S clasp, b, substantially in the manner as and for the purpose described.

35,677.—James Greaves, of Utica, N. Y., for Improvement in Pumps:

I claim, first, Making the barrel, A, with the exterior enlargement, B, and valve seat, L, in one piece, the washer, D, as used in combination with the enlargement, B, and flange, C, the float valve, 2, water chamber, R, and small pipe, S, as constructed and combined with barrel, A, and pipe, 3, the lead lining, 4, or equivalent, fastening the flange, F, to the wood pipe, E, the combination of the flange, G, with the pump, H, the iron bottom, O O, as made and combined with the wood, H, the ornamental cap, I, as constructed and covered with the metal, P, the ventilator, No. 2, as constructed and combined with the pump, H, the plunger, No. 3, as constructed, the feet of the cross piece, 1, projecting in opposite directions, in line with the valve seat outer edge, and riveting it to said seat, the washer, 5, as fastened with the screws, 6 6, to the seat, 2.

Second, The rubber strips, 2 2 2 2, No. 4, or equivalent, as combined with the shaft, 1, and pump, 3, joint, 6, as constructed and combined with strip, O, and projection, 7, the guide, 8, and its lining of leather or equivalent, all as and for the purpose described.

35,692.—Henry Knight, of Jersey City, N. J., for Improvement in Machines for Moulding Cement Pipe:

I claim, first, The combination of the table, B, movable platform, L, mould or flask, M, plate, K, core, I, and jack-screw, G H, or its equivalent, the whole constructed and arranged and operating substantially as and for the purposes described.

Second, The combination of the wheeled truck, L, and railway bars, F F, with a cement pipe molding machine, substantially in the manner and for the purpose described.

Third, The combination of the pliable washer with the hard shoulder of the core, substantially as described and for the purpose set forth.

Fourth, The construction of the plate, K, with flaps, d d, and with apertures of different diameters, substantially as and for the purpose described.

Fifth, The manner of arranging the guides, a, and the short posts, E E, with the rack bar, G, and core, I, for the purpose set forth.

Sixth, The connection of the shoulder or collar, J, to the core, I, by means of an adjustable through pin, b, in the manner and for the purpose described.

Seventh, The lifting of the base plate, K, and the flask or mould above the truck platform by means of the ends of the pin, b, or an equivalent means, substantially as described.

35,696.—G. W. Lloyd, of Detroit, Mich., for Improved Mode of Constructing and Arranging Foot-lights for Theatres:

I claim the position and mode of arrangement of the lights with the continuous reflector, as distinguished from the mode now ordinarily in use.

I claim also the power of throwing colored lights on the stage, as above described.

And I claim by means of the guard formed by the sunken trough, and the wire cloth covering, greatly increased safety to performers.

35,697.—W. R. Manley, of New York city, for Improved Feathering Paddle Wheel:

I claim making the length of the arm or crank, 6, so proportionate to the distance which the horizontal centre of the axis is from the horizontal centre of the bucket, that the centre of the journal bearing in the outboard bucket flange, and the centre of the journal bearing in the feathering flange, are equidistant from a straight line projected indefinitely, from the centre of the journal bearing in the inboard bucket flange, through the centre of the bucket, as has been described and as is represented in figure 8.

35,733.—John Gallagher (assignor to himself, Christopher Dorflinger, Anson Judson, and Antoine Regan), of Brooklyn, N. Y., for Improvement in Lighting and Trimming Lamps:

I claim, first, Suspending the wick tube, C, by means of the journals, I I, or their equivalents, and operating substantially as and for the purposes described.

Second, I claim the opening, B, with its door, D, for the purposes described and set forth.

35,742.—James Webster (assignor to J. H. Porter and Robert Porter), of Birmingham, England, for Improvement in Manufacture of Oxygen Gas. Patented in England, Oct. 19, 1861:

I claim the obtaining the oxygen nitrogenous compounds, and the base of the salt employed in the manner stated.

35,753.—E. E. Hendrick, of New York City, for Improved Lubricating Composition:

I claim, as a lubricator for machinery, a fluid or compound, the bulk or excess of which is composed of coal-oil produced in a state of nature, and with which caoutchouc is combined.

35,754.—E. E. Hendrick, of New York city, for Improved Lubricating Composition for Machinery:

I claim the use of a solution of caoutchouc in connection with coal-oil and water, substantially in the manner and for the purpose set forth.

35,769.—S. T. McDougall, of Brooklyn, N. Y., for Improvement in Gas Stoves:

I claim, first, The burner, J, having a contracted top, Q, with tight joints between the sides of the burner and the circumference of the perforated plate, O', when used for heating purposes, substantially as specified.

Second, The above-described burner, or its equivalent, in combination with a gas-stove composed of the base, A, cylinder, B, breast, C, and top, D, substantially as described.

35,794.—Anson Warren and J. W. Martin, of Maquoketa, Iowa, for Improvement in Water Elevators:

We claim, first, The relative arrangement of the winding pulley, C, and wheels, D D', constructed as described, and operating in connection with the cord, N, guides, K K', and buckets, E E', in the manner and for the purposes specified.

Second, The combination of the spiral bow-shaped guides, K K', swivels, H, horizontal arms, I, and flat links, J, all constructed, arranged, and operating in the manner and for the purposes set forth.

Third, The combination of the cross-beams, L M, automatic valve, F G, hinged link, J, and spout, e, operating in the manner explained, to first tilt the bucket, and afterward discharge the water through the spout, a or a'.

35,800.—G. R. Boynton (assignor to G. G. Pope and E. F. Slocum), of Chicago, Ill., for Improvement in Lanterns:

I claim the jacket, F, in combination with the spiral wire or partition, d, placed in the space, a, between the jacket and the oil-cup or fountain, B, substantially as and for the purpose set forth.

35,801.—J. S. Bradford (assignor to J. C. Manning), of Baltimore, Md., for Improvement in Burners for Coal-Oil Lamps:

I claim the application and use of vulcanized india rubber, as a base or bottom for burners for coal-oil or kerosene-oil lamps, and the flange or cut-off thereto, thereby breaking the metallic connection, and preventing the communication of heat from the burner to the lamp or to the metallic socket in which said burner is fixed or screwed, in the manner and for the purpose set forth.

35,802.—Benjamin Douglas (assignor to W. and B. Douglas), of Middletown, Conn., for Improvement in Pumps:

I claim the securing of the pump cylinder, A, to its plank, D, by means of brackets, C C, formed of two parts, b c, connected together by bolts, d, and fitted on the cylinder, substantially as and for the purpose set forth.

35,806.—N. Aubin, of Albany, N. Y., for Improvement in Fluid Meters:

I claim, as of my own invention, a reversing apparatus and valve, or valves, constructed and acting under a mode of operation, substantially as described, in combination with a cylinder or its equivalent, in which the flow of water is checked, or caused to cease by the stoppage of a motion of a ball or its equivalent for the purpose acting, substantially in the manner and for the purpose specified.

35,807.—J. A. Bassett, of Salem, Mass., for Improvement in the Manufacture of Gases for Illuminating and other Purposes:

I claim preserving a uniform high temperature in the decomposing retort, by the employment of steam, superheated immediately previous to its introduction into said chamber, and introduced before its temperature is materially lowered, by means of apparatus constructed and arranged, substantially as shown and described.

35,809.—Timothy L. Carley and Amos Jackson, of Marcellus, N. Y., for Improved Water Wheel:

We claim the parts, C D E F G H I and J, when made as specified, and used for the purpose set forth.

35,822.—Isaac Hayes, of Philadelphia, Pa., for Improved Water Wheel:

I claim the employment of the tapering, spiral tubes, A A A, in combination with the central chamber, C, and continuous supply pipe, D, the same being arranged to operate together, in the manner described, for the purpose specified.

35,829.—J. L. McPherson, of Sacramento City, Cal., for Improvement in Pumps:

I claim, first, The movable box, C, in the lower part, B, of the pump cylinder provided with the tube, D, and valve, F, and arranged as shown to admit of a chamber, E, around the tube, D, within box, C, as set forth.

35,835.—L. C. Ober, of Boston, Mass., for Improvement in Lanterns:

I claim the arrangement of india rubber, or other elastic packing, between the deflector, supporter, and glass casing of the lantern, whereby the currents of air are prevented from passing up between the said supporter and the casing, and are caused to flow into the deflector, and through and around the outer surface thereof, substantially in manner and for the purpose set forth.

35,838.—Jacob Reese, of Pittsburgh, Pa., for Improvement in Furnaces for Coal-Oil Stills:

I claim the mode described, of constructing stills, the bottom of which is composed of more than one piece, and furnaces therefor, in such a manner that all the joints, seams, and rivets which are placed inside of the fire chamber shall rest upon or be covered by walls or supports of brick-work or cement, and thus protected from the direct action of the fire, substantially in the manner and for the purpose set forth.

35,860.—N. W. Williams, of Frankfort, Pa., assignor through mesne assignments to himself, for Improved Lamp Burner:

I claim, first, The exterior casing, E, with its oblong opening, F, in combination with the elongated wick-tube, D, when so arranged and connected together as to leave an unobstructed opening below for the free admission of air to the chamber between the casing and the tube, as set forth for the purpose specified.

Second, Flaring the lower end of the casing, E, so as to overhang the cover, A, and permit the gases passing from the reservoir at the point where the cover is secured to the same to pass upward into the chamber, P, as set forth.

Third, I claim securing the exterior casing to the wick-tube by means of strips, i, bent from and forming part of said casing, as specified.

RE-ISSUE.

1,320.—S. L. Avery, Norwich, N. Y., for Improvement in Water Elevators. Patented May 8, 1860:

I claim coupling a crank to any windlass shaft, in such a manner that the said crank can be instantly uncoupled from said shaft, and then be used as a break lever, for the purpose of checking or controlling the reverse movements of the said windlass shaft, all substantially as set forth.

I also claim arranging a crank with a windlass shaft, a ratchet wheel and a pall, in such a manner that the instant the said crank is uncoupled from the windlass shaft, a further action upon said crank will relieve the ratchet wheel from the action of the pall, and also cause a friction brake to so act upon the windlass shaft as to check or control its reverse movements, all substantially as set forth.

COAL-TAR PRODUCTS.—The products of coal-tar in the Great Exhibition in London, are said to be of great interest, and are displayed in an attractive manner. Paraffine, aniline, fuschine, magenta, and the numerous other derivatives and compounds, form a highly interesting group to contemplate, and the interest is not diminished by reflecting on the triumph of science, in producing them from a substance apparently so worthless as coal-tar.


## GAS AND WATER-PIPE.

W. & J. GRIFFITHS & CO.—City Tube Works, Malleable Iron and Brass Foundry, No. 27 North Seventh street, Philadelphia. Manufacturers of Wrought Iron Pipe, Lap-Welded Flues and Fittings; also, Brass Work of all descriptions, for Gas, Steam and Water. Particular attention given to Heating Buildings, &c.

CAST AND WROUGHT IRON Pipe, Branches, Elbows, Sleeves, &c. Lamp-Posts, Wrought-Iron Lanterns for Lamp-Posts, Gas Retorts (clay or iron), Street Mains in 9 or 12 feet lengths. Sheet-Iron cut to pattern for Gas-holders. For sale by the Manufacturers' Agent,
HENRY G. NICHOLS, 24 Pine st., N. Y.

HUNTER, KELLER & CO., Manufacturers of
*WROUGHT-IRON PIPES & FIXTURES,*
of all descriptions, for
**STEAM, WATER AND GAS.**
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GIRARD TUBE WORKS—MURPHY & ALLISON, Proprietors. Wrought Iron Coke-Welded Tubes, for Gas, Water, Steam, &c. Wrought, Cast and Malleable Iron Fittings, Steam and Gas Cocks, Valves. Also, Galvanized Tubes and Fittings.
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PATENT BITUMENIZED PIPES for Water, Gas, and Drainage.—These pipes possess all the properties necessary for the conveyance of Gas, Water, and also for Drainage purposes, viz., great strength, great durability, and perfect inoxidability; and being non-conductors are not affected by frost, like metal pipes; they are proved to resist a pressure of 220 lbs. on the square inch (equal to 500-ft. head of water), and can be made up to any greater strength if required. They are only one-fourth the weight, and when laid down are fifty per cent. cheaper than iron pipes; they are made in 7 ft. lengths, and the joinings are simple and inexpensive.

These Pipes have been in use nearly three years, and have given the most perfect satisfaction.

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C. ELTON BUCK, ANALYTICAL and Consulting Chemist, 39 Nassau st., New York. Analyses of Ores, Minerals, Soils, Guanos, Coals, &c., and Tests of Commercial Articles, carefully and promptly made. Consultations may be had, and opinions given on Chemical questions. Samples for analysis from a distance, may be sent by mail or express, directed to the Laboratory as above.

"NEW BOOKS." ANY OF OUR Readers who may require books on the subject of Gas-Light, Heat, Water, Sewerage, or other scientific matters, can be promptly supplied by addressing the Publisher of The AMERICAN GAS-LIGHT JOURNAL, No. 58 Liberty st., New York.


## PATENT-OFFICE NOTICES.

UNITED STATES PATENT-OFFICE,
WASHINGTON, April 17, 1862.

ON THE PETITION OF PHEBE Ann Fisk, Executrix, &c., of Almond D. Fisk, late of the City, County, and State of New York, praying for the extension of a Patent granted to the late Almond D. Fisk, Nov. 14, 1848, and re-issued March 6, 1860, for an improvement in Coffins, for seven years from the expiration of said Patent, which takes place on the 14th day of November, 1862.

It is ordered that the said petition be heard at the Patent-Office on Monday, the 27th of October next, at 12 o'clock m.; and all persons are notified to appear and show cause, if any they have, why said petition ought not to be granted.

Persons opposing the extension are required to file in the Patent-Office their objections specially set forth in writing at least twenty days before the day of hearing; all testimony filed by either party to be used at the said hearing must be taken and transmitted in accordance with the rules of the office, which will be furnished on application.

The testimony in the case will be closed on the 13th of October next; depositons and other papers relied upon as testimony, must be filed in the office on or before the morning of that day; the arguments, if any, within ten days thereafter.

Ordered, also, that this notice be published in the "National Republican," Washington, D. C., and "Tribune," New York, N. Y., once a week for three successive weeks; the first of said publications to be at least sixty days previous to the day of hearing.

D. P. HOLLOWAY,
Commissioner of Patents.


GAS THERMOMETERS FOR ascertaining and regulating the emperature of the gas while passing through the purifiers into the station meters. For sale at the Rooms of the AMERICAN GAS-LIGHT JOURNAL.

## PORTABLE GAS-WORKS.

STRATTON & BROTHER'S PATENT GAS-WORKS, for making Gas from ROSIN or COAL OILS. STRATTON'S Patent Double Retort, for Coal, Wood, or Rosin.

Our Patent Gas Works have been put up in some forty Country Residences, Factories, Churches, &c., in which an experience of *ten years* gives entire satisfaction.

Water Works also put up in country residences. All work warranted.

Reference—Prof. JAS. C. BOOTH, U.S. Mint, Phila.
CHRISTOPHER FALLON, "
STRATTON & BROTHER,
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BUTLER'S PATENT PORTABLE **ROSIN GAS-WORKS,**
FOR
*Dwellings, Churches, Country Villages,*
As well as for Consumers in Large Cities.
JOHN BUTLER,
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Brooklyn, N. Y.

FOR LIGHTING RAILROAD CARS AND STEAMBOATS
☞ WITH GAS.
The whole process of Filling the Gas-Holders of a Railway Train, requires but Three Minutes.
Apply to the
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C. R. WOODWORTH, Manufacturer of
**PORTABLE GAS WORKS,**
74 WALL STREET, NEW YORK CITY.

## ANTI-FREEZING APPARATUS.

FREEZING OF GAS-PIPES.—Walton's Patent Anti-Freezing Apparatus illustrated by Engravings in the AMERICAN GAS-LIGHT JOURNAL, of Jan. 1, 1861, page 212, is the most simple, durable and efficient of any known process.

See also certificates from Cincinnati, O., and Louisville, Ky. Gas-Works in same number, page
Address, JOHN WALTON,
Sup't Gas-Works, Louisville, Ky

## STOP-COCKS, &C.,

DANIEL THOMPSON, Machinist and Manufacturer of Stop-Cocks, Fire-Plugs, &c., for Water-Works, Stop-Cocks, Valves, Drip Pumps, &c. for Gas-Works, No. 133 Elfreth Alley, Philadelphia.

## UNION WIRE-WORKS.

ROBERT McMURRAY & CO. No. 29 Fulton Street, New York. Manufacturers of Copper, Brass, and Iron Wire Cloth for Gas Works, all kinds of Foundry Riddles, Sieves, and Screens. Improved Wire Window Shades, Wire Bolting Cloth, Duster-Wire, Wire Cloth for fanning machines, Rosin, &c., Locomotive Wire, Fire Guards, Ornamental Wire Work of every description. Patent Improved Wove and Laid made Dandy Rolls repaired and designed to order.

## GAS-METER FLUID.

FLUID FOR GAS-METERS.—The undersigned is prepared to furnish the Glycerine Meter Fluid in quantities to suit purchasers. *It does not evaporate, can be made to stand any degree of cold liable to occur in this country or inCanada, and does not corrode the metals of the meter. It has been in use successfully for the last three years.*

For particulars, references, &c., address the manufacturer, HENRY BOWER,
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## PATENT AGENCIES.

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Gratis and post free, "The Inventor's Manual," also a pamphlet, "L'Obtention de Patentes Anglaises," 500 Mechanical Movements; the first part of Kinematics, or the Transformation of Motion, by Joseph Willcock, C. E., Mem. Soc. of Eng. May be had at the above address, and of any bookseller. Price 2s. 6d.

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## DRAIN-PIPE.

DRAIN PIPES, ENGLISH AND AMERICAN.
**Garnkirk Chimney Tops,**
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For Sale by
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THE

## STERLING GAS-REGULATOR,

**Improves the Light and Saves a Large Per Centage of Gas.**

MANUFACTURED BY THE

WHEELER & WILSON SEWING MACHINE COMPANY.

It is well known that Printers require the best and most brilliant light. In proof of the superiority of these Machines over all others, the following New York establishments are using them, and testify to their excellence:—New York Times, New York Herald, New York World, New York Tribune, New York Sun, Journal of Commerce, Courier & Enquirer, Evening Post, The Zietung, Dispatch, Leader, Scientific American, Advertiser and Spectator, Independent, Daily News, Harper's Monthly and Weekly, Transcript, Mercury, Atlas, Life Illustrated, Albion, Spirit of the Times, AMERICAN GAS-LIGHT JOURNAL, Christian Enquirer, Churchman, Church Journal, Christian Advocate, Christian Ambassador, Christian Intelligencer, Observer, Sunday Times, Sunday Courier.

By order of the New York and Brooklyn Common Councils, these Regulators are now used in the City Halls, Police Stations, Markets, and other Public Buildings in both cities.

**They are Warranted by the**

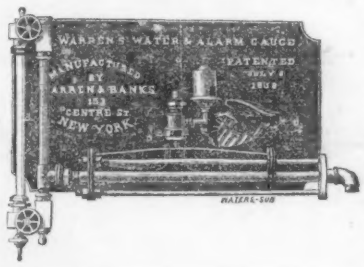
**WHEELER & WILSON SEWING-MACHINE CO.,**

**505 BROADWAY, NEW YORK,**

To keep in order, and always maintain the pressurs of the Gas at the lowest point for a brilliant light and economical combustion. They are so constructed that *under no circumstances can the Mercury get into the Meters, or in any way injure them.*

## WARREN'S PATENT WATER & ALARM GAUGE

**For Protecting the Flues and Preventing Steam-Boiler Explosions.**

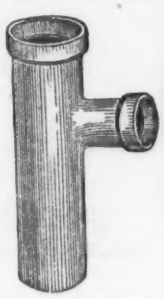



This is a reliable High and Low Water Detector, arranged so as to render it one of the best Water Gauges ever attached to a Steam-Boiler; always presenting before the Engineer at sight the exact height of the water, and if, by oversight or by sudden leakage, the water gets low in the boiler, it will cause an alarm before the water gets below the flues, thereby preventing an explosion. This Gauge can be made to alarm at any point desired as a High Water Detector, thereby preventing the water from getting to that height as to be forced into the cylinder of the engine, often causing serious accidents. Thus it is a High as well as a Low water Detector. For sale by

WARREN & BANKS,

153 Centre st., corner of Canal st., New York,

Where a Gauge is constantly in operation.



## GAS, STEAM, SMOKE,

## PURE WATER & SOIL PIPE,

FROM

## JOSEPH CLIFF

**Wortley Fire-Brick Works, Leeds, England.**

**T. W. PARMELE, Agt.,**

**No. 4 Irving Place, N. Y.**

## JOHN RUSSELL & CO.,

## PATENT TUBE MAKERS,

THE OLD TUBE WORKS, WEDNESBURY, AND THE ALMA WORKS, WALSAL, STAFFORDSHIRE,

**69 UPPER THAMES ST., & 5 CHARLES ST., SOHO, LONDON;**

AND 35 GRANBY ROW, MANCHESTER, ENGLAND.

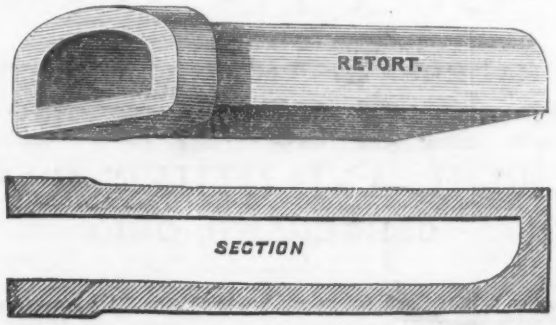
The original Manufacturers of WROUGHT-IRON GAS TUBES, and the Inventors of the Lap-welded Tubes for Locomotive and Marine Boilers. All kinds of TUBES and FITTINGS, whether for Gas, Steam, or Water. Galvanized and Composition Tubes. Chandeliers, and every kind of Brass work for Gas and Steam.

STOCKS, DIES, AND TAPS OF ALL SIZES. CAST-IRON PIPE AND GAS-METERS.

**All Goods Warranted.**

## KING BROTHERS,

## STOURBRIDGE, ENGLAND, FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for Burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them

**Free from Cracks and Correct in Form.**

By great care in Manufacturing, combined with the advantages in Burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

RETORT OVENS, FIRE-BRICKS, GUARDS, SADDLES, RABITTED BURS, FLUES, AND QUARRIES, ARE ALL MANUFACTURED OF THE SAME QUALITY OF CLAY.

**EVERY RETORT AND BRICK IS BRANDED "KING BROTHERS, STOURBRIDGE."**

Apply to E. W. BARSTOW, 83 Maiden Lane, New York, where samples can be seen.

## HARRIS & PEARSON,

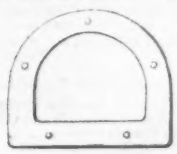
PROPRIETORS OF

## Best Glass-House Pot & Crucible Clay.

**Manufacturers of Fire-Bricks, Gas-Retorts, and Glass-House Furnace-Bricks of every description.**

AMBLECOTE FIRE-CLAY AND BRICK WORKS, STOURBRIDGE, ENGLAND.

## COWEN'S PATENT FIRE-CLAY RETORTS.



## JOSEPH COWEN & CO.,

**BLAYDON BURN, near Newcastle-on-Tyne, England,**

Have always been, and are still, the most extensive manufacturers of FIRE-CLAY RETORTS in the United Kingdom, and were the only parties to whom a Prize Medal was awarded at the Great Exhibition, in London, 1851, for

## "GAS RETORTS, AND OTHER OBJECTS IN FIRE-CLAY."

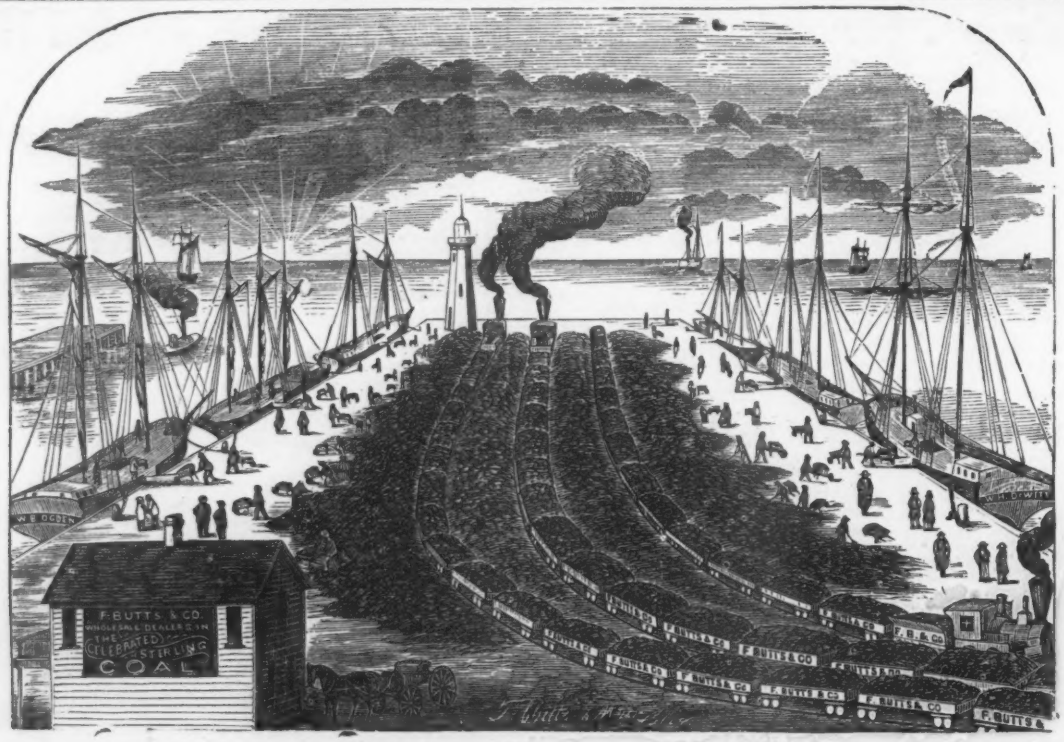
J. C. & CO. make Fire-Clay Retorts of all shapes and dimensions, and to fit existing mouth-pieces.

Orders for FIRE-CLAY RETORTS, TILES, BEARERS, and other articles in Fire-Clay, receive immediate attention, and are promptly executed at their Works, as above. Drawings of Settings adapted for Cowen's Patent Fire-Clay Retorts supplied.

AGENTS, MESSRS. MEAD & BELL,

**13 CLIFF STREET, NEW YORK.**

N. B.—J. C. & CO.'S RETORTS are well adapted for small Gas-Works, as they can be used without an Exhauster.




(View of F. Butts & Co.'s Coal Pier, Cleveland, O., on the Government and Cleveland & Pittsburgh R.R. Piers at the mouth of the Cuyahoga River, Lake Erie.)

# F. BUTTS & CO.,

(Successors to BUTTS & KENDALL,)

DEALERS IN THE CELEBRATED

# STERLING COAL!

## PITTSBURGH, AND OTHER GAS COALS,

**CLEVELAND, OHIO.**

Dear Sir:—We beg leave to call your attention to the following, from which, and others, (and the universal expression of Gas men, as to the superior quality of Sterling Coal,) we believe that it is the best Gas Coal in the country.

*From the MANHATTAN GAS LIGHT CO., New York.*

*Gentlemen:*—Yours of the 9th inst. is received. The "Sterling Coal" received from you during the past year worked very satisfactorily—averaging 9,520 cubic feet of 15 candle Gas per ton of 2,240 lbs., and 41 bushels of Coke weighing 1,465 lbs.

We consider it among the best of American Gas Coals, for the quantity and quality of the Gas produced, and also for the excellent quality of its Coke.

I am Gentlemen, Your Obedient Servant, CHARLES ROOME, President.

*From the OGDENSBURGH GAS CO., Ogdensburgh, N. Y.*

January 6, 1862.

*Messrs. F. Butts & Co.*—This Company has used your Sterling Coal since July, 1860. We consider it the best Coal we have ever used; gives us larger yields of Gas, requires less lime, and makes a superior Coke. Respectfully, Yours, R. E. GORDON, Sup't Og. Gas Works.

*From the RONDOUT AND KINGSTON GAS LIGHT CO., Rondout, N. Y.*

January 10, 1860.

*Messrs. F. Butts & Co.*—Gentlemen:—This Company have used your Coal nearly two years. It is in every respect satisfactory, and to it is given the preference over all other coals. Its average yield is 4 40.100. The light clear and strong. The Gas is easily purified and quite free from sulphur. The yield of Coke is large and of superior quality. It is, in my opinion, equal to any Gas Coal in the market. Very Respectfully, WM. W. HAGUE, Sup't.

*From the SANDUSKY GAS CO., Sandusky, O.*

January 6, 1862.

*Messrs. F. Butts & Co., Cleveland.*—Gentlemen:—We have used your Sterling Coal for two years and six months past, and find it superior in quality and all that a number one Gas Coal can be. The illuminating power of the Gas is high, the Coke is of a superior quality, and in many instances our monthly average product has been 4 40.100 per one lb. Coal. It gives us entire satisfaction. I am, Gentlemen, Yours, Respectfully, WILLIAM HUDSON, Sup't and Sec'y.

*From the TOLEDO GAS LIGHT CO., Toledo, O.*

*Gents:*—Your favor of the 28th inst. to hand and noted.

The Sterling Coal received from Messrs. Butts & Co., the last summer and fall, fully sustains the character it has as a Gas Coal, from previous use in our works. We think the quality of Gas is very good, a little better than that produced from the Coal had of them the year previous—yielding 8,666 feet per ton of 2,000 lbs., and 36 bushels of Coke of very good quality, well adapted to our use.

Respectfully, Yours, GEO. SPENCER, President.

*From the BUFFALO GAS LIGHT CO., Buffalo, N. Y.*

*Messrs. F. Butts & Co.*—The Sterling Coal we have had from you we find to be an excellent Gas Coal. The yield of both Gas and Coke is good. The illuminating power of the Gas is high and the quality of the Coke is very good. ROBERT ROBSON, Foreman Gas Works.

*From the CLEVELAND GAS LIGHT & COKE CO., Cleveland, O.*

*Gentlemen:*—This Company has used between 3,000 and 4,000 tons of your "Sterling Coal," and are still using it with very satisfactory results. We find the average product of a ton of 2,000 lbs. is about 8,800 feet of Gas, and about 37 bushels of Coke. The Gas is of good illuminating power and quite free from sulphur or other impurities, one bushel of lime purifying 9,000 feet, and the Coke of vesy superior quality.

The yield of Gas is about the same as from the Pittsburgh Coal, and the Coke is better adapted to our use. Yours, Truly.

T. DWIGHT EELLS, Secretary.

*From the ALBANY GAS LIGHT CO. Albany, N. Y.*

*Messrs. F. Butts & Co.*—Gentlemen:—We have been using your "Sterling Coal" at these works for two years, finding it all that is important in Gas-making Coal, as respect yield and quality of Gas, and freedom from sulphur—as much so as any of the Coaking Coal in use. We are disposed to contract for a frther supply of the same quality.

Very Respectfully, PAUL A. SABBATON, Sup't.

*From the TROY GAS LIGHT CO., Troy, N. Y.*

*Messrs. F. Butts & Co.*—Gentlemen:—The Coal we have used for the past year at our works has been mostly "Sterling." It has given us full satisfaction in every respect.

S. S. DAUCHY, Sup't.

The following analysis of "Sterling Coal" was made by Prof. J. Lang Cassels, Professor in the Cleveland Medical College, who stands at the head of his profession as a chemist, and any statement made by him can be relied upon with safety.

| | | COMPOSITION OF ASHES. | |
|---|---|---|---|
| Sp. gr. | 1,288 | | |
| Eygremaeric Moisture | 1.85 | Silex | 0.80 |
| Volative Combustible Matters | 34.15 | Alumini | 0.45 |
| Coke (clear and porous) | 64.00 | Sulphate of Iron | 0.75 |
| | 100 | | 2.00 |
| Fixed Carbon in the Coke | 62.00 | | |
| Ashes (yellowish white) | 2.00 | Per centage of Sulphur | 0.23 |
| | 64.00 | | |

J. LANG CASSELS, M. D.,
Prof. of Chemistry, Clev. Med. Co.

P. S.—The specimen from which the above analysis was made was taken by myself from a car load, and may be regarded as a fair average; in fact, this coal is very uniform in its characteristics. It also yielded 4 per cent. more gas than the Pittsburgh Coal. J. L. C.

We would also refer to Gas Companies in the following places:

New York City (Manhattan and New York Co.'s), Brooklyn, Albany, Troy, West Troy, Rochester, Oswego, Ogdensburgh, Lansingburgh, Newburgh, Rome, Palmyra, Geneva, Yonkers, Rondout, Kingston, Albion, Brockport, Seneca Falls, Elmira and Lyons, in State of New York; Cleveland, Toledo, Sandusky, Norwalk, Oberlin, Salem and Fremont, in Ohio; Detroit, Ann Arbor, Grand Rapids, Kalamazoo, Jackson and Adrian, in Michigan; Coburg, in Canada; Chicago, Ill., and two Companies in Milwaukee, Wisconsin.

STERLING COAL MINES, situated in Pennsylvania, are wholly under our control; the coal mined and sold only by us or our agents. (Agents in every instance having authority over our signature.)

Five years experience in Mining, Sale and use of Sterling Coal, gives us full confidence in asserting there is no Coal that combines all the requisites so largely for a Gas or Smithing Coal as this.

This year we are several hundred yards further in the Mine than last season, and feel assured Sterling Coal will more than sustain the high reputation it has heretofore gained.

Our facilities largely increased for Mining and Shipping, we are prepared to supply the great demand for this Coal on a much more extensive scale.

Not being dependent upon high water for transportation, but receiving our Coal by RAIL, we are at all times prepared to fill orders, and ready to contract for delivery of the Celebrated Sterling Coal, on board Vessel or Cars at Cleveland, or at works of Gas Light Co's, in any of the Northern States or Canada.

Cleveland, *January* 15, 1862. Address— **F. BUTTS & CO., Drawer 74, Cleveland, O.**

# POTTS' REVOLVING SIGNAL LIGHTS,

## PATENTED SEPTEMBER 8, 1857.

Mr. ALBERT POTTS, the well known Inventor of the LAMP POST LETTER BOXES, which have been adopted by the Post Office Department for the large cities of the United States—and also of the GAS METER BOX, to be set in the front walls of houses, thus doing away with visits from Gas Inspectors, or burglars in gas-clothing, has lately brought forward a third Invention, which in point of importance and world-wide usefulness, surpasses the others entirely.

**These SIGNAL LIGHTS are intended for use on Vessels propelled by Steam, and those exclusively. They specially indicate the presence of a Steamer, and by their use, there will be less likelihood of mistakes, and consequent collision than at present. They are also intended for SIGNALLING AT NIGHT, and can be used for that purpose UNDER ANY CODE of SIGNALS NOW ARRANGED FOR FLAGS.**

This Improvement in Lights for Steam Vessels, consists in having the Lanterns containing the colored lights, connected by means of a series of cogged gearing with some convenient part of the Engine or Machinery, so as to cause them to have a revolving motion around their axis. On side wheel steamers, the Lanterns should be placed directly over the wheel-houses, and the power, or motion to turn them, may then be very conveniently obtained from the paddle wheel shaft. On Propellers, the Lanterns should be placed on each side of the Pilot House, or hurricane deck, and the rotary motion derived from any convenient or suitable part of the Engine or Propeller Shaft. Each Lantern is supported on the end of movable cranes, so that their relative positions may be changed and properly adjusted to suit the view of observers on either side of the vessel at the time of signalling.

The Lanterns to be used in this improvement may be constructed for Burning Oils, Fluids, Gas, or any of the known modes of illumination, and should be furnished with one or more lenses and reflectors, so as to concentrate the rays of light, and project them over the horizon with the greatest intensity. The lenses for this purpose should be made with colored glass, viz., Red and Green, and the position of the respective Lanterns, according to the color of the lenses therein, must be placed on the sides of the vessel so as to answer to the requirements of Rules and Regulations made and published by the Supervising Inspectors of Steamboats, agreeably to the Act of Congress of the United States in such cases made and provided. That is to say—by said Regulation—the Lantern having the green lenses for producing the Green Colored Light, must be placed on the starboard side of the vessel, and the other Lantern producing the Red Light, to be placed on the port side thereof In pursuance, also, of the aforesaid Rules and Regulations, there is to be found in board and behind each Lantern, a screen to answer the purposes therein mentioned.

The cogged gearing, by which the Lanterns are connected with the Engine or paddle wheel shaft, and thereby caused to revolve when the Engine is in motion, is so arranged that the connection may be readily shipped or unshipped, and the lanterns made stationary or otherwise, at the pleasure of the Pilot, or those whose duty it may be to operate and attend to the same. The cranes on which the Lanterns are placed, are also rigged so as to be readily turned horizontally from one position to another, so as to present one or both lights to the view of observers when laying athwart ships at the time of signalling

### On the Use and Application of the Improvement for Night Signals.

When the vessel is under weigh, or going ahead in its course, the Lanterns are to be placed directly athwart ships, so that such colored light therein will then have the position and place prescribed by Rule Seventh of the afore-said Supervising Inspectors of Steam Boats, and with the screens behind them, as above described, will then answer all the intents and purposes for which the colored lights are thus required to be used, as illustrated in the several diagrams published by said Inspectors for the working of a system of Colored Lights. The Lights in this case, according to the color seen by the observer, indicate the course or direction of the vessel whereon they are carried When the Lanterns with the colored lights therein, are made to revolve around on their axis, as proposed in this improvement, in addition to the signal above, another, and as we believe, very important and useful signal is thus formed, indicating that the vessel, whereon it is carried is a Steamer. In dark foggy nights, it is found by experience, to be somewhat of a difficult task to distinguish sailing vessels from Steamers and Propellers, especially when the latter are rigged, and carry a press of sail. When Steamers meet "head and head," it is the duty of each to pass to the right, or, on the larboard side of the other. Whereas, when a Steamer meets a sailing vessel, the former must give way and allow the latter to pursue its course. Hence, to carry out the regulations of the said Steamboat Inspectors, and prevent collisions, it is important to have some infallible sign, whereby the character of the vessel may be readily seen and determined. Several very fatal collisions have recently taken place through mistakes of this kind.

### On Signals for Speed and Distance.

The gearing of the Lanterns with the paddle wheel or propeller shaft, may be so arranged as to be an index of their speed A very good proportion, would probably be to make the Lanterns turn about one third as fast as said shaft. Hence, when the speed of the vessel is previously known, when making a certain number of revolutions of the paddle or propeller, it becomes an easy task from observing the time with which the Lanterns thereon may be turning to approximate to the speed with which the said vessel is moving at the time of observation. Again, as the arcs described by the rays of light from each lantern, as they revolve around on their axis, is greater in proportion to the distance from said lantern, so will the time in which said rays move over any given space, be less in the same proportion. Hence, when the lights are very remote, or far off, from the observer, the duration of each column or cylinder, of rays from each lense, would pass the eye of the observer, in a short space of time, or with great velocity. Whereas, at a nearer point of observation, the time of its passage would be considerably lengthened, or the motion thereof apparently much slower. From these facts, we believe the improvement is susceptible of indicating, in an approximate manner, the speed and distance of vessels whereon the revolving lights may be used.

### On the Application of the Improvement for Marine Telegraphic Purposes.

The Revolving Lights can be readily applied to the general purposes of Marine Signalling at night, as follows: In order to show this application, we have adopted the Numbers as given in Roger's Code of Marine Day Signals, believing that work to be somewhat of a standard in matters of this kind. Instead of the flags used in the above code, for day signals, to indicate the combinations of two or more letters of the Alphabet, which combination is referable to certain numbers indicative of the words or sentences telegraphed, we propose to perform the same operation, at night, by means of the two revolving colored lights, so as to indicate the numbers directly to which the intended words or sentences to be telegraphed are referable. Thus, whether the vessel to be signalled is ahead, astern, or abaft the beam, the position of the two colored lights must be so adjusted, by means of the moveable cranes, whereon said lanterns or lights are fixed, that the two lights may be fully made visible to the observer. When both lights are thrown into this position, stopping the motion of the lanterns may be the signal for calling attention, or a rocket fired off, or the steam whistle blown, would answer the same purpose. Now, in order to represent the ten numerals, we propose to indicate them by the respective motions of the two colored lights, as follows:

| RED LIGHT. | | | | GREEN LIGHT. | | | |
|---|---|---|---|---|---|---|---|
| One Red, Represents Number | | | 1. | Two Green, Represents Number | | | 2. |
| Three | do. | do. | 3. | Four | do. | do. | 4. |
| Five | do. | do. | 5. | Six | do. | do. | 6. |
| Seven | do. | do. | 7. | Eight | do. | do. | 8. |
| Nine | do. | do. | 9. | One | do. | do. | 0. |

In the above arrangement, it will be seen that all the odd numbers are made by the Red Light, and the even numbers by the Green Light. In order to indicate the repeat of the last number, once or more times, or for other special purposes, which may hereafter be found useful and necessary, an even number of lights may be shown by the Red, and an odd number by the Green. It will be understood that when the Lanterns are made with three lenses in them, the numerals as above arranged are formed by the number of times a new light or lense is presented to the observer. Thus to indicate the number 3, the Red Light or Lantern would make one entire revolution; and to make the number 6, the Lantern carrying the Green Light would make two revolutions, and so on with the other numbers. When a symbol is made, the motion of the Lantern is to be suspended for a short time, and when a number expressing a sentence is formed, the lantern may be stopped for a longer period, or some one of the special signals above referred to, may be used for this purpose.

To show the application of this improvement as above mentioned, whereby these Lights can be used as readily for Night Signals, as Flags are used for Day Signals by the author of Roger's Code, we shall use the sign O, colored red or green, according to the light used, to show the number of movements performed by the respective lights in order to represent any desired number of said code, suitable for the required purpose.

| RED LIGHT. | GREEN LIGHT. |
|---|---|
| O, O, O, O, O, | |
| O, O, O, O, O, O, O. | |
| | O, O. |
| | O. O. |

The above would represent the number 5722, and by reference to said Roger's Code, would be found to stand before the sentence:

"WILL YOU SHOW THE NUMBER THAT REPRESENTS YOUR NAME?"

| RED LIGHT. | GREEN LIGHT. |
|---|---|
| O. | |
| O, O, O, O, O. | |
| O, O, O, O, O, O, O. | |
| | O, O. |

Here the number expressed is 1572, and per the same Code, stands for

"WHERE ARE YOU BOUND?"

| RED LIGHT. | GREEN LIGHT. |
|---|---|
| O. | |
| O, O, O, O, O, O, O, O, O. | |
| | O, O. |
| | O, O, O, O, O, O, O, O, O. |

The number thus expressed is 1928, and per said Code is

"WHAT IS YOUR CARGO?"

| RED LIGHT. | GREEN LIGHT. |
|---|---|
| O, O, O, O, O. | |
| | O, O, O, O, O, O. |
| | O. |
| O, O, O. | |

Here the number expressed is 5603, and stands for

"HAVE YOU ANY NEWS?"

(RED LIGHT.)

*Fig. 2*

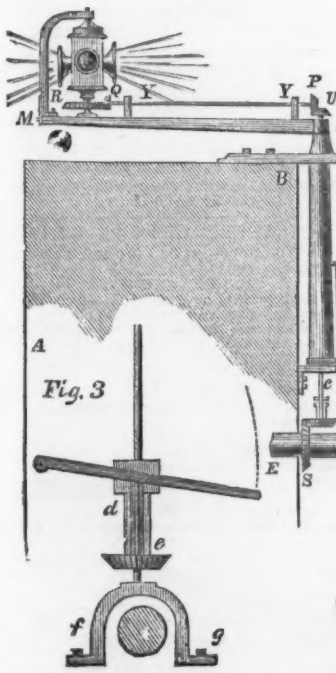



*Fig. 3*

(GREEN LIGHT)

*Fig. 1*

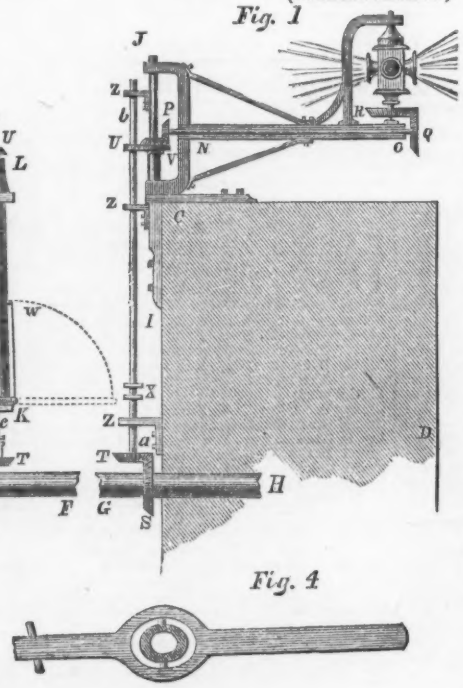



*Fig. 4*



## MECHANICAL CONSTRUCTION.

In our engravings, Figs. 1 and 2, represent Vertical Sections through the wheel-house. In them E F and G H represent portions of the main Shaft. In Fig. 1, I J is a stout Iron or Wooden post, fastened against the side of the wheel-house, directly over the main shaft On the upper part of this post, is fitted the moveable arm or crane N O, to the main shaft is fitted the bevel wheel S, and to the lower end of the rod a b, is fitted a corresponding wheel T. U is a small pinion on a b, which gears with the spur wheel, V, which in turns gives motion to the wheels, P and Q, and so revolves the lamp R. It will be seen that a Rotary motion is given to the lamp, when the main shaft is in motion and a b connected.

It can be disconnected by a lever, acting between the bosses X, which will elevate the rod in the guides Z Z Z.

Fig. 2 is another arrangement, for the same purpose. In this, K L, represent a hollow Shaft, on which is firmly fastened, the arm L M, on which is the lantern. The hollow post is secured to the wheel-house by the straps K and B, and it can turn freely in them, the other part being the same in them as in fig. 1

The lever K W, when drawn down, will turn the frame in any required position around the Shaft c U. In fig. 1, the arm or crane N O, may be operated by cords from the wheel-house, but in this device, the rod c U, does not lift up as in fig. 1, but in its place, the lower end is made square, and on it slides the short tube, d E, shown in fig. 3. The lower end of the rod turns on a bridge, f g, spanning the main shaft. On the upper end of the tube, d e, a lever is attached by means of boxes and collars as shown in fig. 4. This lever when raised carries with it the beveled wheel T, thus disconnecting the gearing apparatus.

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